"A PROSPECTIVE STUDY OF ROLE OF TRANEXAMIC ACID IN POST-OPERATIVE BLEEDING AND SEROMA IN MODIFIED RADICAL MASTECTOMY"

Thesis

Submitted to the faculty of

ALL INDIA INSTITUTE OF MEDICAL SCIENCES, BHOPAL

For the award of the degree of

Degree of MS

in

General Surgery

by

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AIIMS, Bhopal Institutional Human Ethics Committee- Student Research (IHEC-SR) in its 7th meeting held on 22nd February 2023 discussed your proposal titled **"A prospective study of role of tranexamic acid in postoperative bleeding and seroma in modified radical mastectomy"** and evaluated it for suitability for your dissertation as required for fulfilment of MD/MS program.

Following members attended the meeting:

1. Prof. D. K. Pal, Former HoD Community Medicine, GMC, Bhopal.....Chairperson
2. Prof. Rajnish Joshi, Professor of General Medicine, AIIMS, Bhopal.....Member
3. Prof. Amit Agrawal, Professor of Neurosurgery, AIIMS, Bhopal.....Member
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9. Dr. Shashank Purwar, Professor of Microbiology, AIIMS, Bhopal.....Member Secretary

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The AIIMS, Bhopal IHEC-SR approves your research protocol. All research related activities must begin only after the date of this approval. The validity of this approval is till two years from the date of issuance. Please submit a closure report / renewal request before expiration of the validity for this approval.

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ACKNOWLEDGEMENT

First and foremost, praises and thanks to God, the Almighty, for His showers of blessings throughout my research work to complete the research successfully.

I take this opportunity to thank our Honourable Director, the Dean Academics, all members of the Thesis Review Committee, and the Institutional Human Ethics Committee for permitting me to pursue this research work. I express my sincere gratitude to Dr. Pradeep Saxena, Professor and Head, Department of General Surgery, AIIMS Bhopal, for providing a constructive academic environment and promoting scientific temperament. I want to convey my heartfelt thanks to my guide andmentor, Dr. Shyamlal, Professor, Department of GeneralSurgery, for providing invaluable guidance throughout this research. It was my privilege to have worked under her and nurtured my skills and knowledge in every aspect of patient care. Their wisdom and clinical acumen are unparalleled, encouraging me to become a better researcher and a more passionate doctor. Iam extremely grateful to my co-guide Dr. Swagata Brahmachari, Additional Professor, Department of General Surgery, for mentoring me in the approach to patients and for his brilliant guidance and remarkable communication skills that enabled me to build agood rapport with the patients. His systematic and time-bound instructions on how toproceed with the research stimulated me to complete this dissertation. I am thankful to all the nursing staff and supporting staff of the Departments of General Surgery, for their kind support and cooperation throughoutthis work.

I express my gratitude to my seniors **Dr Suruchi, Dr Suprateek Saha, Dr Aman, Dr Rohit and Dr Rima,** and my juniors **Dr Ganesh** and **Akshay** for their support in my study. I am extremely grateful to my parents for their love, prayers, and caring and made this journeypossible to complete this research work. Most importantly, I thank all my patients forbeing a part of this noble cause, and for teaching me new lessons on medicine and life,every single day.

- **Dr Madhu Babu**

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APPENDIX III: LIST OF ABBREVIATIONS

MRM	MODIFIED RADICAL MASTECTOMY
TXA	TRANEXAMIC ACID
NTXA	NON TRANEXAMIC ACID
HV	HALF VACUUM
FV	FULL VACUUM
CON	CONVENTIONAL
FF- G	FLAP FIXATION USING AN ADHESIVE TISSUE GLUE
FF-S	FLAP FIXATION USING SUTURES
SSI	SURGICAL SITE INFECTION
NAC	NIPPLE AREOLAR COMPLEX
ER	ESTROGEN RECEPTOR
PR	PROGESTERON RECEPTOR
HER 2	HUMAN EPIDERMAL GROWTH FACTOR RECEPTOR 2
UOQ	UPPER OUTER QUADRANT
UIQ	UPPER INNER QUADRANT
LOQ	LOWER OUTER QUADRANT
LIQ	LOWER INNER QUADRANT

INTRODUCTION

Breast cancer is the most prevalent form of cancer worldwide, affecting millions of women each year. Its high incidence makes it a major public health concern, demanding ongoing attention and resources. The disease's widespread impact is not limited to any one region; it affects women across all continents and demographics, making it a truly global challenge. In recent years, there have been significant strides in the early detection and screening of breast cancer. These advancements are mainly due to a combination of factors. First, public awareness campaigns have played a crucial role in educating women about the importance of regular screenings and self-examinations. Increased awareness has led more women to seek diagnostic procedures, such as mammograms, at earlier stages, improving the chances of detecting the disease when it is most treatable.

Secondly, technological advancements in breast imaging have revolutionized the way breast cancer is diagnosed. Techniques such as digital mammography, breast MRI, and ultrasound have become more sophisticated, providing more precise and more accurate images that help in the early identification of tumors. These tools have improved the accuracy of diagnoses and reduced the number of false positives, thereby minimizing unnecessary patient stress and procedures.

Despite these improvements, breast cancer remains the leading cause of cancer-related deaths among women. This is particularly concerning because, while early detection can significantly improve survival rates, many women still face challenges in accessing timely and effective treatment. Factors such as socioeconomic status, geographic location, and healthcare disparities contribute to variations in outcomes, with women in low-income or rural areas often experiencing delays in diagnosis and treatment.

Moreover, breast cancer's impact extends beyond the physical health of individuals. It also has profound psychological, social, and economic implications. The emotional toll on patients and their families can be immense as they navigate the complexities of treatment, potential loss of income, and the fear of recurrence. The economic burden on healthcare systems is also considerable, given the costs associated with long-term treatment, including surgery, chemotherapy, radiation, and ongoing monitoring.

Surgery is one of the definitive options for carcinoma of the breast – Modified radical mastectomy is one the widely performed procedures for breast cancer. The surgery is associated with many complications. One of the most common complications associated with the surgery is seroma formation.

Postoperative seroma formation is a common complication following modified radical mastectomy (MRM), occurring in up to 40% of patients(1).Seromas are fluid collections that accumulate in the surgical site, leading to increased patient discomfort, prolonged recovery, and additional interventions such as aspiration or drainage (2).Several factors contribute to seroma formation, including surgical technique, tissue handling, and the amount of dead space created during the procedure. (3)

Various techniques have been employed to reduce seroma formation, including compression garments, fibrin sealants, closed suction drains, and flap fixation to the chest wall. However, despite these interventions, seroma formation continues to be a common and persistent issue, with a high incidence. Notably, very few studies have explored the use of tranexamic acid to reduce postoperative seroma, leaving a gap in research regarding its potential effectiveness in this context.

Tranexamic acid (TXA) is an antifibrinolytic agent that has gained attention in various surgical disciplines for its ability to reduce bleeding and improve hemostasis(4). Its mechanism of action involves inhibiting the conversion of plasminogen to plasmin, thereby preventing the breakdown of fibrin and promoting clot stability(5).Recent studies have explored the potential of TXA to reduce seroma formation by minimizing bleeding and subsequent tissue fluid accumulation at surgical sites.

In breast surgery, TXA has demonstrated effectiveness in reducing blood loss and the need for blood transfusions (6). Preliminary evidence suggests that its use may also reduce seroma formation following MRM (7). By promoting hemostasis and stabilizing the fibrin clot in the surgical area, TXA may help mitigate the factors contributing to seroma development.

Given the implications of postoperative seroma formation on patient recovery and healthcare costs, investigating the role of TXA in reducing this complication is of significant clinical importance. This study aims to assess the effectiveness of tranexamic acid in minimizing seroma formation in patients undergoing MRM, potentially offering a new therapeutic approach to improve postoperative outcomes.

REVIEW OF LITERATURE

BREAST ANATOMY :

The breast, a modified sweat gland, is a highly specialized structure in both males and females, with significant differences in its development and function between the sexes. The breast remains underdeveloped in males due to the absence of the hormonal triggers necessary for its growth. However, in females, the breast plays a crucial role in reproduction, primarily by producing and secreting milk to nourish infants, making it an essential supplementary organ of the reproductive system. (8)

STRUCTURE OF THE FEMALE BREAST :

The female breast is on the anterior chest wall, overlying the **pectoralis major muscle**. It typically extends vertically from the second to the sixth rib. The structure of the female breast includes several key components:

1. **Glandular Tissue**: This is the functional tissue responsible for producing milk. It consists of 15 to 20 lobes subdivided into smaller lobules. Within the lobules, clusters of **alveoli** are responsible for milk production during lactation .(9)
2. **Ductal System**: Each lobe is connected to a **lactiferous duct**, which transports the milk produced in the lobules toward the nipple. These ducts converge and open onto the surface of the nipple.(8)
3. **Adipose Tissue (Fat)**: Surrounding the glandular tissue, adipose tissue contributes to the breast's size and shape. The amount of fat largely determines the breast's volume.(10)

4. **Connective Tissue**: This tissue provides structural support and holds the glandular tissue in place. **Cooper's ligaments**, a part of this connective tissue, anchor the breast to the underlying muscle and skin.(9)

5. **Nipple and Areola**: The central part of the breast includes the nipple, where the ducts terminate, and the pigmented **areola** surrounding it. The areola contains sebaceous glands that lubricate and protect the nipple during breastfeeding.(8)

The pectoralis major muscle forms the breast base, extending from the second to sixth rib early in life but extending to below the sixth rib as the breast matures and sags. As already said breast is anchored to the pectoralis major fascia by the Cooper ligaments. Nonetheless, the breast can move because of the flexibility of these ligaments. Most women experience a ptotic breast as a result of the Cooper ligaments becoming stretched with aging. The bottom pole of the breast is fuller than the upper pole due to gravity. The tail of Spence extends in the axilla.(11)

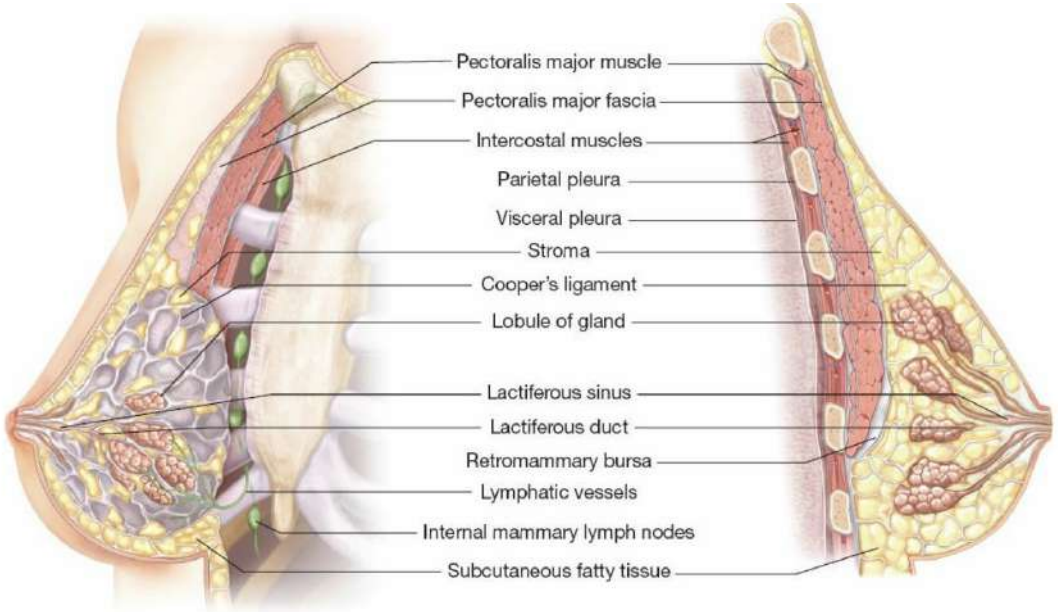


Image 1: shows breast anatomy and the chest wall.(12)

Blood is supplied to the breast from the following vessels:

Arterial supply to the medial aspect of the breast is via the **internal thoracic artery** (also known as the internal mammary artery) – a branch of the subclavian artery. It provides a major blood supply to the breast.

The lateral part of the breast receives blood from four vessels:

- **Lateral thoracic and thoracoacromial branches** – originate from the axillary artery.
- **Lateral mammary branches** – originate from the posterior intercostal arteries (derived from the aorta). They supply the lateral aspect of the breast in the 2nd, 3rd, and 4th intercostal spaces.(13)

The veins primarily follow the route of arterial distribution, with the gland's venous outflow flowing preferentially toward the axilla. There may be noticeable significant anastomoses in the superficial venous plexus of the breast parenchyma through the skin on top. The Circulus venosus is an anastomotic circle that forms around the nipple due to superficial veins. Veins from this circle and deeper aspects of the gland converge to drain blood to the periphery of the breast and, after that, into vessels that terminate in the internal mammary, axillary, and internal jugular veins.(12)

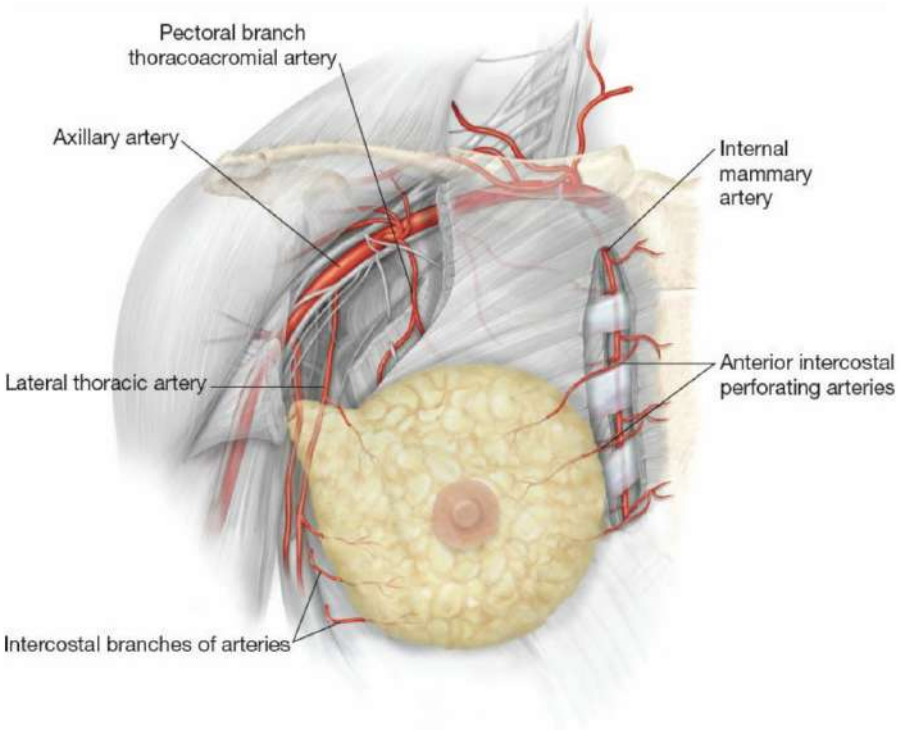


Image 2: Arterial supply of the Breast(12)

Lymphatic drainage of breast:

Lymphatic drainage of the breast is primarily via the laterally positioned axillary lymph node groups (levels I, II, III). Because the lines dividing the axilla's lymph node groups are not clearly defined, there have been significant differences in the terminology used for these nodal divisions. These variations are particularly evident in level I nodal groups. Historically, anatomists have described four principal levels (groups) of axillary lymph nodes, whereas surgeons typically identify six groups, including three anatomic levels. The following are the terminology that are most frequently used to characterize the axillary nodes:

1. **Axillary Vein Group (Lateral Group)**
    - **Location:** Lateral and posterior to the axillary vein at Level I.
    - **Function:** Receives lymph from the upper extremity and ipsilateral back (except for lymph draining into the deltopectoral/infraclavicular nodes).
2. **External Mammary Group (Anterior or Pectoral Group)**
    - **Location:** Along the lower and lateral border of the pectoralis minor at Level I.
    - **Function:** Primarily drains lymph from the breast parenchyma, connecting to central lymph nodes and potentially to subclavicular nodes and Rotter's group.
3. **Scapular Group (Posterior or Subscapular Group)**
    - **Location:** Near the posterior wall of the axilla, adjacent to the lateral scapula at Level I.
    - **Function:** Drains lymph from the neck, posterior trunk, and shoulder region, passing into central and subclavicular nodes.
4. **Interpectoral or Rotter's Group**
    - **Location:** Between the pectoralis major and minor at Level II.
    - **Function:** Drains lymph into the central and subclavicular nodes.
5. **Central Group**
    - **Location:** Centrally positioned behind the pectoralis minor at Level II.
    - **Function:** Receives lymph from the lateral axillary, external mammary, and scapular groups, as well as directly from the breast. Drains into subclavicular nodes.
6. **Subclavicular Group (Apical Group)**

- **Location:** Above and posterior to the upper border of the pectoralis minor at Level III.
- **Function:** Receives lymph from all other axillary nodes, leading to the formation of the subclavian trunk, which can connect to the internal jugular vein, subclavian vein, or thoracic duct.(12)

The lymph nodes are categorized into three levels (I, II, and III) based on their anatomical location relative to the pectoralis minor muscle.

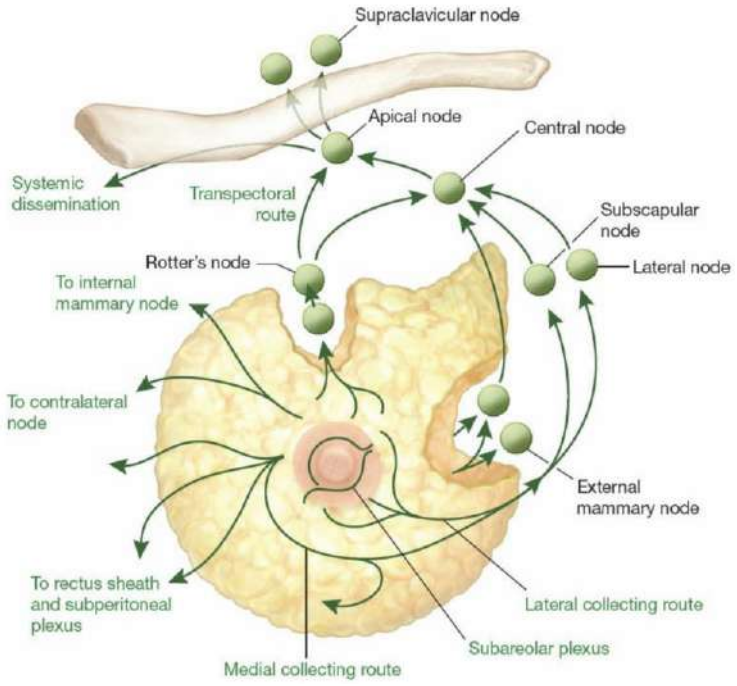


Image 3:- Schematic drawing of the breast identifying the position of lymph nodes relative to the breast and illustrating routes of lymphatic drainage(12)

Nerve supply of the breast:-

The breast is innervated by the anterior and lateral cutaneous branches of the 4th to 6th intercostal nerves. These nerves include sensory and autonomic nerve fibers (the autonomic fibers govern smooth muscle and blood vessel tone).

It should be mentioned that the production and secretion of milk are not regulated by these nerves. The pituitary gland secretes the hormones oxytocin and prolactin, which control this.(13)

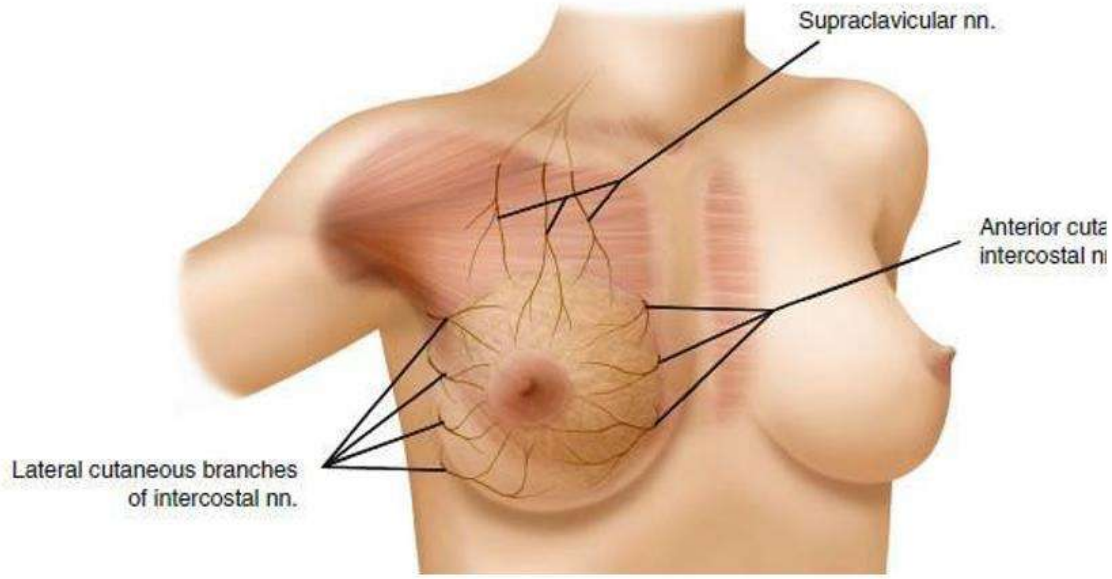


Image 4 :- Sensory innervation of the breast

EPIDEMIOLOGY :

Breast cancer remains a leading health concern globally, with approximately 2.3 million new cases diagnosed annually, as reported by GLOBOCAN 2020(14). According to the World Health Organization (WHO), cancer is the primary cause of disease burden among women, accounting for 107.8 million Disability-Adjusted Life Years (DALYs). Notably, breast cancer contributes significantly to this burden, responsible for 19.6 million DALYs.(15).

India has seen a significant shift in cancer trends, with this disease rising from being the fourth most common cancer in the 1990s to now becoming the most prevalent cancer among women. The global breast cancer burden is projected to surpass 2 million cases by 2030. In India, breast cancer incidence has risen sharply, with a 50% increase between 1965 and 1985. According to 2016 estimates, India reported:

- 118,000 new cases (range: 107,000-130,000), with 98.1% affecting females

- 526,000 prevalent cases (range: 474,000-574,000)

Over the 26-year period from 1990 to 2016:

- The age-standardized incidence rate of breast cancer in females increased by 39.1% (range: 5.1-85.5%)

- Every Indian state witnessed a rise in breast cancer incidence. As per the GLOBOCAN data for 2020, in India, BC accounted for 13.5% (178361) of all cancer cases and 10.6% (90408) of all deaths, with a cumulative risk of 2.81. (16)

Breast cancer has numerous risk factors, categorizable into two main groups:

1. Non-modifiable factors (uncontrollable):

   - Gender

- Genetics

- Family history

- Age

- Race/ethnicity

2. Modifiable factors (controllable):

- Lifestyle choices

- Environmental exposures

- Hormonal factors

- Dietary habits

Female Sex:- Being female is a significant risk factor for breast cancer due to higher hormonal exposure. Women's breast cells are highly sensitive to estrogen and progesterone, making them more susceptible to cancer development when hormone balances are disrupted. In contrast, men typically have negligible estrogen levels, resulting in a significantly lower risk. Indeed, breast cancer is predominantly a female disease, with men accounting for less than 1% of all breast cancer cases.(17)

Age:-Currently, about 80% of patients with breast cancer are individuals aged >50, while at the same time, more than 40% are those more than 65 years old. The risk of developing breast cancer increases as follows—the 1.5% risk at age 40, 3% at age 50, and more than 4% at age 70.(17)

The epidemiology of breast cancer in India differs significantly from Western countries. In the Western world, the median age at diagnosis is approximately 61 years, with a peak age

range of 60-70 years. In contrast, Indian women tend to develop breast cancer at a younger age, with a peak age range of 40-50 years and a higher proportion of premenopausal cases. This earlier onset is concerning, as early-stage breast cancer is more aggressive and has a poorer prognosis than late-stage breast cancer.

Furthermore, there is a striking difference in the stage at diagnosis between Indian and Western women. In the United States, 60-70% of breast cancer cases are diagnosed at stage 1, whereas in India, only 1-8% of cases are diagnosed at this early stage. Conversely, Indian women are more likely to be diagnosed at advanced stages, with 29-52% presenting at stage III and 6-24% at stage IV, compared to 10% in the United States. These disparities highlight the urgent need for targeted interventions, increased awareness, and improved access to early detection and treatment in India to address the unique challenges posed by breast cancer in this population.(18)

Family history:- A family history of breast cancer is a significant risk factor, with 13-19% of patients having a first-degree relative (parent, sibling, or child) affected. The risk increases substantially with each additional affected relative, especially if diagnosed before age 50. Regardless of age, individuals with a family history have a higher incidence rate, driven by epigenetic changes and environmental factors acting as potential triggers. This emphasizes the importance of genetic counseling, early screening, risk assessment, and prevention strategies for those with a family history, highlighting the critical role it plays in breast cancer risk assessment and management.(17)

Genetic mutation:-Genetic mutations significantly increase breast cancer risk, with two major high-penetrance genes identified: BRCA1 (chromosome 17) and BRCA2

(chromosome 13). Other high-penetrance genes linked to breast cancer include TP53, CDH1, PTEN, and STK11. These genes play a crucial role in breast cancer development and are important targets for genetic testing, counseling, and risk management strategies to identify individuals with increased susceptibility.(17)

Reproductive History:- Reproductive events significantly influence breast cancer risk, with factors such as age at first menstruation, age at first full-term pregnancy, number of births, duration of breastfeeding, and menopause onset playing crucial roles. Notably, having a first full-term pregnancy at an early age, especially in the early twenties, and having multiple births are associated with a reduced breast cancer risk, whereas hormonal fluctuations during these events can induce carcinogenic changes in the breast microenvironment (17)

Race and ethnicity, Previous radiation exposure, History of breast cancer, and Breast tissue density are other non-modifiable risk factors.

Physical activity, Overweight/obesity, Alcohol intake, Smoking, Insufficient vitamin supplementation, Intake of processed, and Exposure to chemicals are some of the modifiable risk factors.

SYMPTOMS:-

Breast lump is the most common presenting symptom among women with breast cancer and has a relatively high predictive value for malignancy. **Koo et al. (2017) identified 56 presenting symptoms in a study conducted in 2017 on the** 2316 population - Breast lump was the most common symptom, recorded in about four-fifths of all women (83%). The next most commonly reported presenting symptoms were nipple abnormalities (7%), breast pain

(6%), and breast skin abnormalities (2%). Non-breast symptoms (e.g., back pain (1%) and weight loss (0.3%)(19).

So Breast problems can present themselves in several ways, like breast pain, nipple discharge, cystic lesions, and, more commonly, a lump. A lump in the breast is of great concern to the patients and is also a challenge to the diagnostic understanding and judgment of the surgeon. A three-dimensional or space-occupying lesion in the breast is a significant indicator of both benign and malignant diseases. However, non-neoplastic conditions such as traumatic fat necrosis, breast abscesses, fibroadenosis, and breast cysts can also form lumps, causing psychological distress for patients. Accurate diagnosis is crucial to distinguish between benign and malignant lesions and provide appropriate treatment, alleviating patient anxiety and ensuring effective management. Of these, malignant breast disease is the most dreaded one, feared not only by the patients but also by the surgeons as well (20).

DIAGNOSIS:-

In 1956, **Haagensen and Stout,** in their seminal work *Diseases of the Breast*, emphasized the importance of a multi-modal approach to breast cancer diagnosis. They proposed that combining three key methods—clinical examination, mammography, and fine-needle aspiration cytology (FNAC)—offers a more accurate diagnostic tool for evaluating breast lesions. This three-step approach later termed the "triple assessment," significantly improved diagnostic precision, reducing the risk of false negatives and ensuring timely intervention. Their research laid the foundation for this diagnostic strategy, which has since become the gold standard in breast cancer care, particularly for detecting malignancies early and guiding treatment decisions.(21).

The triple assessment is a well-established diagnostic approach used to evaluate breast lesions and is considered the gold standard in breast cancer diagnosis. It comprises three essential components:

1. **Clinical Examination:**
    - A thorough physical examination of the breast is conducted to assess any palpable lumps or abnormalities. This step includes palpation for masses and evaluation of their size, consistency, mobility, and associated symptoms. **Dillon et al. (2015)** said that the clinical examination provides initial insight into the nature of the lesion and can raise suspicion of malignancy in some cases. (22).
2. **Imaging (Mammography and Ultrasound):**
    - Mammography is a key imaging modality that provides detailed X-ray images of the breast, helping to identify masses, microcalcifications, and structural abnormalities. **Smith et al. (2017)** suggest that ultrasound is often added to assess the characteristics of any detected lumps, especially in younger women with denser breast tissue, where mammography can be less sensitive. (23)
3. **Pathology (Fine-Needle Aspiration Cytology or Core Biopsy):**
    - Fine-needle aspiration cytology (FNAC) or core needle biopsy is performed to obtain cells or tissue samples from the breast mass for microscopic evaluation. FNAC is a minimally invasive technique that allows for rapid diagnosis, while core biopsy provides a more comprehensive tissue sample, enabling a more detailed histological examination. **Verkooijen et al. (2002)**

state that this component provides definitive pathological confirmation of whether the lesion is benign or malignant.(24)

combination of all modalities - clinical examination, mammography, and fine-needle aspiration cytology (FNAC) is more accurate than individual modality alone. **Karim et al**., in a study, found a positive predictive value of 100%, a negative predictive value of 77%, sensitivity of 94.7%, and specificity of 100%.(25)

EVOLUTION OF SURGICAL TREATMENT IN BREAST CANCER :

The surgical treatment of breast cancer has undergone significant changes over the past century, reflecting advances in medical knowledge, surgical techniques, and an understanding of cancer biology. Initially dominated by radical approaches, the field has shifted towards more conservative and targeted strategies, ultimately improving patient outcomes and quality of life.

Late 19th to Mid-20th Century:-

The earliest surgical treatments for breast cancer were radical mastectomies, notably popularized by **William Halsted** in the late 19th century. Halsted's radical mastectomy involved the removal of the entire breast, underlying chest muscles, and axillary lymph nodes, based on the belief that cancer spread locally and required extensive removal to ensure cure (26). The radical removal of the breast, pectoral muscles, and axillary lymph nodes often resulted in considerable **physical disfigurement** and **loss of function**. Patients frequently experienced **chronic arm swelling** (lymphedema) and **reduced shoulder mobility** due to the extensive removal of lymph nodes and muscle tissue. He emphasizes that a local recurrence (cancer returning at the site of the surgery) was rare with Halsted's radical approach, occurring in only 6% of cases. Halsted acknowledges that despite the successful

removal of the primary tumor, many patients still died from distant metastases, indicating that surgery alone could not cure all patients. This highlights the limitations of surgery in treating systemic disease.

Mid-20th Century:-

The **NSABP (National Surgical Adjuvant Breast and Bowel Project) B-06** trial was a landmark clinical trial initiated in 1971 to compare the effectiveness of radical mastectomy (the standard breast cancer treatment at the time) with less invasive surgical treatments for women with primary operable breast cancer. The trial involved **1,665 women** from **34 United States and Canada institutions**. Revealed that:

1. **No significant difference in survival or treatment failure** was observed between patients treated with radical mastectomy and those treated with less radical procedures (total mastectomy with or without radiation).
2. In patients with **clinically negative axillary nodes**, less invasive treatments like total mastectomy (with or without radiation) were just as effective as radical mastectomy in preventing recurrence and prolonging survival.(27)

It led to a decline in the use of Halsted's radical mastectomy and the rise of **modified radical mastectomy** and **breast-conserving surgeries** as standard treatments. (28)

Modified radical mastectomy:-

Patey and Dyson's Approach: In 1948, **D.H. Patey and W.H. Dyson** proposed the **Modified Radical Mastectomy (MRM)**, which preserved the pectoralis major muscle but still removed the breast and axillary lymph nodes. This transition towards MRM was fueled by the realization that the extensive removal of muscles, as practiced in radical mastectomy, was often unnecessary, particularly when the cancer had not infiltrated these areas. By sparing the major pectoral

muscle, MRM preserved arm mobility and strength, which significantly improved the patient's quality of life after surgery.

The shift towards MRM gained momentum through the 1970s and 1980s, as comparative studies showed no significant difference in survival rates between radical mastectomy and the less aggressive MRM. By the early 1980s, MRM had largely replaced radical mastectomy as the primary surgical treatment for breast cancer. For example, in the USA, the percentage of surgeries using MRM rose from 27.7% in 1972 to 73.2% by 1981 (29).

MRM became the preferred surgical approach through the 20th century as **comparative studies** demonstrated that MRM offered **similar survival rates** to more radical surgeries but with fewer postoperative complications and better recovery outcomes. This led to MRM replacing radical mastectomy in the majority of cases.

3. Introduction of Lumpectomy and Radiation (1970s-1980s)

The introduction of **lumpectomy**, a procedure that removes only the tumor and a margin of surrounding tissue, paired with postoperative radiation therapy, became a standard treatment for early-stage breast cancer.. This approach allowed many women to preserve their breasts while effectively treating their cancer.

The National Surgical Adjuvant Breast and Bowel Project (NSABP) B-06 trial compared lumpectomy and axillary node dissection with or without breast radiation with modified radical mastectomy in patients with tumors 4 cm or less in their greatest diameter, demonstrating the value of lumpectomy and breast radiation as the preferred treatment in the majority of patients with invasive operable breast cancer. A 20-year follow-up study revealed no significant differences in overall survival or disease-free survival between patients

undergoing total mastectomy, lumpectomy alone, or lumpectomy with breast radiation. Specifically, comparing lumpectomy alone to total mastectomy, the hazard ratio for death was 1.05 (95% CI: 0.90-1.23, P=0.51), indicating equivalent long-term outcomes and supporting the effectiveness of breast-conserving treatments (27).

4. Advances in Surgical Techniques (1990s-2000s)

The late 20th century saw the refinement of surgical techniques, including **sentinel lymph node biopsy (SLNB)**. Introduced in the 1990s, SLNB allows for the selective removal of the first few lymph nodes (sentinel nodes) that drain the breast, minimizing the extent of axillary surgery while accurately staging cancer . This approach significantly reduced the incidence of complications associated with more extensive lymph node dissections.

The **National Surgical Adjuvant Breast and Bowel Project (NSABP) B-32** trial was designed to determine whether sentinel node resection achieves the same therapeutic

outcomes as axillary dissection but with fewer side effects suggest that sentinel node surgery alone with no further axillary dissection is an appropriate, safe, and effective therapy for breast cancer patients with clinically negative lymph nodes .(27)

5. Personalized Surgery and Neoadjuvant Therapy (2000s-Present)

In recent years, surgical treatment has increasingly embraced **personalized medicine**. Advances in **genomic profiling** enable tailored treatment plans based on tumor characteristics, including hormone receptor status and genetic mutations (30). **Neoadjuvant therapy**, which involves administering chemotherapy or targeted therapy before surgery, has gained traction as a means to shrink tumors and improve surgical outcomes. (31)

NSABP B 31 Trail and HERA trail-tested trastuzumab (Herceptin), in combination with chemotherapy for patients with HER2-positive breast cancer, has transformed treatment

approaches for specific breast cancer subtypes, allowing for more effective and less invasive surgical interventions (32).

6. Current Trends and Future Directions

Today, the surgical treatment of breast cancer emphasizes minimizing invasiveness while maximizing therapeutic efficacy. Techniques such as **robotic-assisted surgery** and **oncoplastic surgery**, which combine oncological and plastic surgical principles, are being explored to improve aesthetic outcomes and reduce complications. Ongoing research continues to evaluate the integration of advanced imaging techniques and intraoperative assessments to enhance surgical precision further.

Conclusion

The evolution of surgical treatment for breast cancer reflects a paradigm shift from radical, invasive procedures to more conservative, targeted approaches. This transformation has not only improved survival rates but has also enhanced the quality of life for patients. Continued advancements in surgical techniques and an increased understanding of breast cancer biology promise further improvements in treatment outcomes.

SEROMA:-

Seroma after breast surgery is defined as a serous fluid collection that develops under the skin flaps or in the axillary dead space following mastectomy and/or axillary dissection. The origin of seroma remains unclear, but several risk factors and predictors are age, breast size, comorbid conditions, presence and number of malignant nodes in the axilla, previous surgical biopsy, and use of heparin or tamoxifen. Seroma formation is believed to result from an acute inflammatory response to surgical trauma, characterized by excessive serous fluid collection.

This process is thought to be driven by increased fibrinolytic activity in serum and lymph, leading to an exudate of fluid from the affected tissue.(33)

After mastectomy, fibrinolytic activity of the plasmin system in serum and lymph contributes to fluid accumulation in dead spaces under skin flaps and in the axillary fossa. Pre-existing fibrin complexes within and around vessels increase leakage of blood and lymph, ultimately leading to seroma formation.(34)

Fabro et al. (2024) conducted a study on 249 women who underwent mastectomy as breast cancer treatment, which revealed the incidence of seroma was 71.1%, requiring, on average, two aspiration punctures until condition resolution. Overweight or obese women and those who underwent axillary lymphadenectomies exhibited 1.92- and 2.06-fold higher risk for seroma development (OR = 1.92; 95% CI 1.02-3.61; p = 0.042; and OR = 2.06; 95% CI 1.17-3.63; p = 0.012), respectively.(35)

Seroma formation is a ubiquitous postoperative issue following mastectomy and axillary surgery, occurring in 3-85% of cases. Due to its high frequency, seroma formation is now considered a predictable side effect of these surgical procedures rather than a complication.(33)

Zielinski et al. (2013) analyzed selected factors influencing seroma formation had found that the cumulative total seroma volume collected by the end of treatment was higher. The overall time of seroma treatment was longer in patients over the age of 60 years ($p = 0.001$ and $p = 0.001$, respectively) and also in patients who had over 130 ml of lymph drained during the first 24 postoperative hours ($p < 0.001$ and $p = 0.001$, respectively). Also, the duration of seroma was significantly longer in obese patients ($p = 0.036$). Additionally, a longer duration of seroma was observed in patients with pathological stages I and II according to TNM-UICC

(p = 0.042) and in patients with ≥ 1200 g weight resected of the mammary gland (p = 0.05).(36)

Surgical techniques also play an important role in seroma formation. **Srivastava et al. (2012)** mentioned that seroma formation is more common in radical mastectomy when compared to simple mastectomy, and seroma formation is more common in mastectomy when compared to breast-conservative surgery – stating that the more the tissue dissection, the more the seroma formation. (33)

A study conducted by **Purushotham et al. (2005)** on 298 patients found that seroma formation is lower in patients undergoing sentinel lymph node biopsy than in conventional axillary dissection.(37)

Surgical factors, including technique, extent of dissection, and the surgical devices used for dissection, may influence seroma formation. However, **Keelen et al. (2024),** in their study conducted on 86 patients, found that was no significant difference in the mean number of days the drain remained *in situ* between the monopolar diathermy group and the LigaSur group (7.75 days *versus* 8.23 days; *P* = 0.613) and there was no significant difference in the mean total drain output between the monopolar diathermy group and the LigaSur group (523.50 ml *versus* 572.80 ml; *P* = 0.694)(38)

Prolonged duration of surgery, removing large volumes of local tissue, and resecting large quantities of locoregional lymph nodes are all reported risk factors for seroma formation in breast surgery.(39)

This complication can delay wound healing, increase the risk of infection, and necessitate repeated fluid aspirations.

Prevention Strategies for Seroma:

1. **Drainage Systems**: Using closed suction drains remains a standard practice to minimize seroma formation by actively removing fluid from the surgical site. However, there is ongoing debate regarding the efficacy of drainage systems, as some studies suggest that prolonged drain usage may not significantly reduce seroma rates and could prolong hospital stays(40).

   A recent meta-analysis study including 8 studies was done to check the effectiveness of half vacuum versus full vacuum drainage in reducing seroma after modified radical mastectomy by **Oyewale et al., and Ariwoola et al. (2024)** found that the 95% CI crossed the line of no effect, indicating that there was no difference between HV and FV drainage in terms of seroma formation (RR:0.67, 95% CI: 0.30 to 1.46, I2=65%). (41)

   A 2015 study by **Troost et al.** investigated seroma formation in 96 breast cancer surgery patients with and without drain placement. The results showed no significant difference between the two groups in seroma frequency (84.6% vs. 90.9%, p=0.290) or volume (540 ml vs. 590 ml, p=0.446). However, patients without drainage had a significantly shorter postoperative hospital stay (2 vs. 2.5 days, p=0.003), suggesting that drain placement may not be necessary to prevent seroma formation. (42)

   A 2024 online survey by **Fairhurst et al**. revealed that 85% of surgeons (82/97) use drains post-mastectomy and axillary surgery, either routinely (39%) or selectively (45%). However, significant variability exists in seroma assessment and management, with other methods like flap fixation being less common. Notably, 52% of respondents (47/91) expressed uncertainty about drain use, and 65% (59/91) believed

a trial evaluating drain vs. no-drain outcomes in simple breast cancer surgery is necessary to inform best practices.(40)

2. **Flap Fixation (Quilting Sutures)**: A key method to reduce seroma is to close dead space by flap fixation, using either sutures or tissue adhesives. Quilting sutures involve anchoring the skin flaps to the underlying tissues, which has been shown to significantly reduce the incidence of seroma formation compared to traditional methods (43). Flap fixation techniques, such as quilting or using fibrin sealants, are associated with fewer postoperative aspirations and a shorter duration of drainage.(43). **Granzier et al. (2019),** in a randomized control trial conducted on 187 patients on conventional wound closure without flap fixation (CON), flap fixation using sutures (FF-S), and flap fixation using an adhesive tissue glue (FF-G) found that the number of seroma aspirations was significantly higher in CON when compared to both flap fixation groups ($p = 0.032$), with no difference between FF-S and FF-G.(44)

3. **Compression Garments**: Compression bandages or garments sometimes apply pressure to the surgical site, helping reduce fluid accumulation in dead spaces. While this method is commonly employed, its efficacy is variable, and evidence supporting its routine use is limited.(45)

4. **Sclerotherapy**: In cases of persistent seromas, sclerotherapy using agents like ethanol can be an option to obliterate the seroma cavity. This technique is generally reserved for treating recurrent or chronic seromas and is considered a secondary prevention method rather than a primary approach(40).

5. **Postoperative Protocols**: Regular postoperative monitoring and early intervention with ultrasound-guided aspirations can prevent the expansion of seromas. Early treatment can reduce discomfort and minimize complications associated with untreated seromas(43).

In conclusion, while no single method completely eliminates seroma formation, combining several strategies—such as quilting sutures, tissue adhesives, and timely postoperative care—can significantly reduce the risk and severity of seromas in breast cancer surgeries like MRM. Further research continues to refine these approaches, aiming for an optimal balance between minimizing seroma and ensuring patient comfort and recovery.

TRANEXAMIC ACID:

Tranexamic acid (TXA) is an antifibrinolytic agent that inhibits fibrinolysis by blocking the conversion of plasminogen to plasmin, an enzyme responsible for breaking down fibrin, the main component of blood clots. Normally, fibrinolysis occurs when tissue plasminogen activator (tPA) or urokinase plasminogen activator (uPA) activates plasminogen, which binds to fibrin in blood clots. This converts plasminogen into plasmin, which degrades the fibrin and dissolves the clot. However, TXA competitively binds to plasminogen, blocking its ability to bind to fibrin and preventing its activation. As a result, fibrin degradation is inhibited, and the blood clot is stabilized, reducing excessive bleeding. (5)

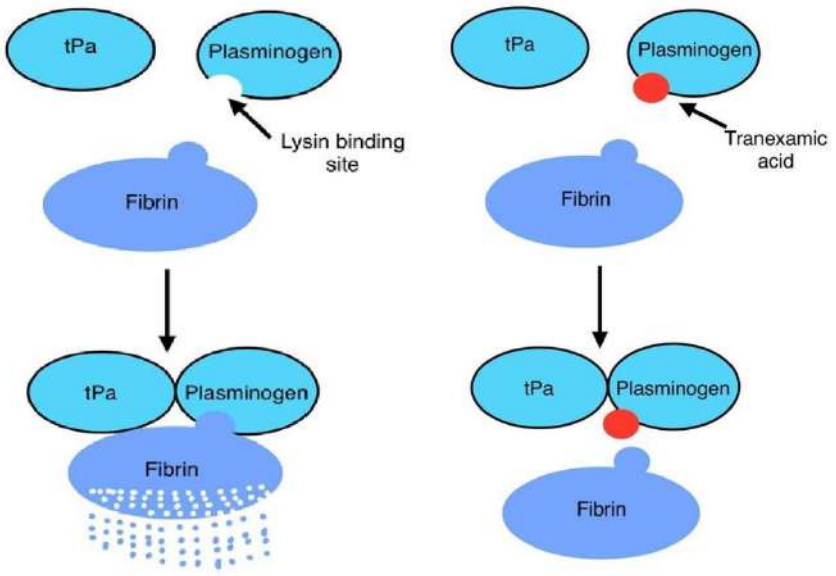


Image 5: Showing the mechanism of action of Tranexamic acid.

Pharmacokinetics and Administration

Tranexamic acid can be administered orally, intravenously, or topically. When given orally, it is rapidly absorbed, reaching peak plasma concentrations within a few hours. It is distributed throughout the body's tissues, including cerebrospinal and synovial fluids. TXA is primarily excreted unchanged via the kidneys, and its half-life is approximately 2 to 3 hours (5)

Side Effects and Risks

While tranexamic acid is generally well-tolerated, some side effects may occur. The most common side effects are gastrointestinal symptoms such as nausea, vomiting, and diarrhoea. There is also a potential risk of thromboembolic events, especially in patients predisposed to clot formation since TXA inhibits clot breakdown. Therefore, patients at high risk for thrombosis should be closely monitored. (5)

Clinical Applications of Tranexamic Acid

Tranexamic acid is widely used in clinical practice to reduce bleeding in various situations:

- **Surgical Procedures:** TXA is frequently used in surgeries with a high risk of bleeding, such as orthopedic, cardiac, or gynecological operations. Studies have shown that TXA reduces perioperative blood loss and the need for blood transfusions. **Ker et al. (2012)** did a meta-analysis on the effect of tranexamic acid on surgical bleeding, which included 129 trials, totaling 10,488 patients; Tranexamic acid reduced the probability of receiving a blood transfusion by a third (risk ratio 0.62, 95% confidence interval of 0.58 to 0.65; P<0.001) (46).

- **Trauma:** The CRASH-2 trial, a landmark study involving 20,211 trauma patients, demonstrated the efficacy of tranexamic acid (TXA) in preventing life-threatening hemorrhage. Patients were randomly allocated to TXA (10,096) or placebo (10,115), with 1,063 deaths (35%) attributed to bleeding. Notably, the trial revealed strong evidence that TXA's effect on bleeding-related deaths varied significantly with time from injury to treatment (p<0.0001), emphasizing the importance of early administration to maximize its lifesaving potential. Early treatment (≤1 h from injury) significantly reduced the risk of death due to bleeding (198/3747 [5.3%] events in the tranexamic acid group vs 286/3704 [7.7%] in placebo group; relative risk [RR] 0.68, 95% CI 0.57-0.82; p<0.0001). Treatment given between 1 and 3 h also reduced the risk of death due to bleeding (147/3037 [4.8%] vs 184/2996 [6.1%]; RR 0.79, 0.64-0.97; p=0.03). Treatment given after 3 h seemed to increase the risk of death due to bleeding (144/3272 [4.4%] vs 103/3362 [3.1%]; RR 1.44, 1.12-1.84; p=0.004)(47).

- **Heavy Menstrual Bleeding:** TXA is also prescribed for menorrhagia (heavy menstrual bleeding), as it effectively reduces menstrual blood loss.(5)
- **Postpartum Hemorrhage:** TXA is increasingly used to control postpartum hemorrhage, reducing maternal blood loss after delivery (47)
- **Dental Surgery in Patients with Bleeding Disorders:** TXA is often applied to manage bleeding in patients with hemophilia or other clotting disorders during dental procedures.(46)

TXA has been used both topically (applied directly to the surgical site) and systemically (administered intravenously) to help control bleeding and fluid accumulation.

Several studies have investigated its efficacy in reducing seroma formation in breast cancer surgeries like **modified radical mastectomy (MRM)** or **breast-conserving surgery** combined with axillary dissection.

A study conducted by **Kush Raj Lohani et al. (2020)** author evaluated the Role of tranexamic acid in axillary lymph node dissection in breast cancer patients- had found that Tranexamic acid (TA) significantly reduced axillary drainage (440 ml vs. 715.5 ml, P = 0.003) and facilitated earlier drain removal (8 vs. 11 days, P = 0.046) after axillary lymph node dissection. While TA showed a trend towards lowering seroma formation (19.1% vs. 32.6%, P = 0.13) and wound-related infections (4.3% vs. 8.7%, P = 0.43), these differences did not reach statistical significance.(48)

Mahmoud S. Eldesouky et al.- evaluated the Effect of topical application of tranexamic acid on the reduction of wound drainage and seroma formation after mastectomy- 115 patients with breast cancer who underwent modified radical mastectomy found that The amount of wound

drainage was significantly lower in the study group as compared with the control group (798.06±107.3 vs. 1067.1±188.6 ml; *P*<0.005). The duration of drainage was also lower in the study group compared to the control group (9.85±1.66 vs. 11.67±1.9 days; *P*<0.005). Eight (12.3%) patients in the study group had seroma formation after the removal of drains, as compared with six (12%) patients in the control group. The study found that tranexamic acid was well-tolerated and safe, with no adverse effects reported. Its use significantly reduced the amount (by 38.5%) and duration of wound drainage after mastectomy but did not impact seroma formation rates.(34)

A 2023 meta-analysis by Gavin et al. found that tranexamic acid (TXA) significantly reduced hematoma rates in breast surgery, from 6.787% to 3.184% (P = 0.020), particularly in cosmetic procedures (9.091% to 3.807%, P = 0.004) and those without axillary lymph node dissection (6.623% to 3.379%, P = 0.003), with no impact on seroma formation or infection rates, and similar hematoma rates in cancer surgery, across 7 studies involving 1446 patients and 1830 procedures.(49).

The use of tranexamic acid (TXA) to reduce seroma formation after breast surgeries, including Modified Radical Mastectomy (MRM) and other procedures like breast-conserving surgery and mastectomy with reconstruction, has produced mixed results. Some studies suggest TXA reduces seroma volume and the need for aspirations by minimizing bleeding, while others show no significant difference in seroma incidence between TXA and control groups. Factors such as surgical techniques, use of drains, and variability in TXA dosage and timing further complicate the findings. Overall, the evidence remains inconclusive, highlighting the need for further research across different types of breast surgery.

GAP IN EXISTING KNOWLEDGE

Breast cancer is one of the most common malignancies among women, and significant advances have been made in its treatment, including the introduction of breast-conserving surgeries (BCS) and oncoplastic breast surgeries, which aim to improve cosmetic outcomes while ensuring effective cancer control. Despite these developments, modified radical mastectomy (MRM) remains a commonly performed surgery, particularly for cases where breast-conserving options are not viable. However, MRM is associated with postoperative complications, the most common being seroma formation—a buildup of fluid that can cause discomfort, delay wound healing, and increase the risk of infection. Various techniques, such as the use of drains, compression garments, and surgical modifications, have been employed to address this issue, but seroma formation remains a persistent problem. Tranexamic acid, a well-known antifibrinolytic agent, has been widely studied and proven effective in reducing intraoperative and postoperative bleeding by stabilizing blood clots. While its use for controlling hemorrhage has shown remarkable results, limited research has explored its potential to reduce postoperative seroma formation. A review of the literature revealed a lack of comparative studies investigating the use of tranexamic acid specifically for this purpose in modified radical mastectomy cases. Given its role in stabilizing clot formation, it is hypothesized that tranexamic acid may also reduce the exudation of serous fluid, thus minimizing seroma formation. This study was therefore undertaken to evaluate the effectiveness of tranexamic acid in reducing seroma formation after modified radical mastectomy, aiming to improve postoperative outcomes and reduce complications related to seroma formation.

RESEARCH QUESTION

RESEARCH QUESTION

What is the role of tranexamic acid in reducing post-operative bleeding and seroma formation in Modified Radical Mastectomy?

HYPOTHESIS

HYPOTHESIS

Tranexamic acid reduces post-operative bleeding and seroma in modified radical mastectomy.

AIMS AND OBJECTIVES

AIIMS AND OBJECTIVES

AIMS:-To evaluate the impact of tranexamic acid on the incidence of postoperative bleeding and seroma formation in breast carcinoma patients undergoing modified radical mastectomy.

OBJECTIVES:-

Primary:

- To study the effect of tranexamic acid in reducing intra and post-operative bleeding in patients of breast carcinoma undergoing modified radical mastectomy.
- To study the effect of tranexamic acid in postoperative seroma in patients of breast carcinoma undergoing modified radical mastectomy

Secondary:

1. To assess the role of tranexamic acid on postoperative wound healing.
2. To evaluate the duration of postoperative drain removal.
3. To assess the incidence of postoperative flap necrosis
4. To evaluate the duration of postoperative hospital stay
5. To assess the rate of postoperative surgical site infections (SSI)

MATERIALS AND METHODS

MATERIALS AND METHODS

STUDY SETTING

The present study was conducted in the Department of General Surgery, All Indian Institute of Medical Sciences, Saket Nagar, Bhopal- 462020, after the institutional ethical committee approval (LOP- AIIMS/BPL/IHECSR/JULY/22/PG/05)

STUDY DESIGN: Non-randomized, Interventional study.

STUDY DURATION: 01st April 2023 to 31st Aug 2024 (18 months)

STUDY POPULATION:

All patients of breast carcinoma attending OPD of the Department of General Surgery, AIIMS Bhopal- who have been diagnosed with carcinoma breast and underwent Modified Radical mastectomy.

Inclusion criteria:

a) All Female patients with operable breast cancer undergoing modified radical mastectomy in AIIMS Bhopal.
b) Patients with operable breast carcinoma of age more than 18 years.
c) All female patients of breast carcinoma undergoing MRM after neo-adjuvant treatment.

Exclusion criteria:

a) Patients of Metastatic breast carcinoma
b) Patients of breast carcinoma with a history of thrombotic disease or high risk of thromboembolism.
c) Patients of breast carcinoma on anticoagulant therapy.
d) Patients of breast carcinoma who had not given consent.
e) Patient of pregnancy-associated breast carcinoma.
f) Patients of breast carcinoma who were not fit for surgery.
g) Patients with breast carcinoma who underwent breast conservative surgery
h) Male breast carcinoma patients.

SAMPLE SIZE:-

Sample size calculation was based on seroma formation in the tranexamic and non-tranexamic acid groups undergoing axillary dissection by the Kesley method. With reference to the previous study(50). The incidence of seroma formation in the tranexamic acid(TXA) group was 19.1, and in the tranexamic acid group(NTXA), it was 32.6.

With a power of 80 % and a significance level of 95%. Assuming a 15 % dropout rate, the sample size was 50. Therefore, we kept 25 patients each in the tranexamic acid group and a nontranexamic acid group.

Kelsey's formula for sample size calculation:

$$n = \frac{(Z_{\alpha/2} + Z_{\beta})^2 \cdot (p_1(1-p_1) + p_2(1-p_2))}{(p_1 - p_2)^2}$$

- **n** = sample size per group (case or control)
- **Z {alpha/2}** = Z-value corresponding to the desired level of statistical significance (commonly 1.96 for a 5% significance level, or α = 0.05)
- **Z {beta}** = Z-value corresponding to the desired power (commonly 0.84 for 80% power)
- **p1** = expected proportion in the control group
- **p2** = expected proportion in the case group
- **p1 - p2** = expected difference in proportions between the groups

ETHICAL ISSUES: -

Permission from the Institutional Human Ethical Committee (IHEC) was taken before the commencement of the study. Letter of permission number-LOP-AIIMS/BPL/IHECSR/JULY/22/PG/05. The subjects were informed about the research and procedures through PIS(Participant Information Sheet). No data collection was done without written informed consent. Confidentiality of information was maintained. During the data analysis, all the personal identifications of the participants were removed.

PROCEDURE:-

All Patients of breast carcinoma who underwent MRM in the General Surgery department in AIIMS Bhopal- from 1st April 2023 to 31st Aug 2024, who met the eligible criteria, were included in the study after taking written informed consent.

The included patients were divided into 2 non-randomized groups as follows:

Tranexamic acid group:-

All the included patients who were operated by investigators (Guide, Co guide) were taken as TXA groups. and receive the intervention.

Non tranexamic acid group:-

All the included patients whom other surgeons operated on were taken as the NTXA group and did not receive the intervention.

Intervention Protocol:-

I**nitial Dose**- A single intravenous (IV) dose of **1 gram of tranexamic acid** diluted in **100 ml of normal saline** was administered at the time of induction of anesthesia immediately before surgery. Following surgery, patients were prescribed **500 mg of oral tranexamic acid**, to be taken **every 8 hours** for the next **5 days**. This approach aimed to maintain a therapeutic level of the drug during the immediate postoperative period, which is critical for preventing the formation of seromas.

OPERATIVE PROCEDURE:-

Skin Incision:

The procedure began with an elliptical incision, also known as a Stewart incision, around the breast. This incision included the nipple-areolar complex (NAC) and the skin over the tumor, ensuring a margin of 1 to 2 cm around the cancerous area.

Raising the Skin Flap:

Using a scalpel or electrocautery, the surgeon carefully elevates the skin flaps. These were raised up to the borders of the modified radical mastectomy, which were defined as follows:

- Lateral boundary: The anterior edge of the latissimus dorsi muscle.
- Medial boundary: The midline of the sternum.
- Superior boundary: The subclavius muscle.
- Inferior boundary: Extends to 3–4 cm below the inframammary fold, marking the lowest extent of the breast.

The skin flaps were lifted at a right angle (90 degrees) to the chest wall, ensuring they contained both skin and subcutaneous tissue. The thickness of the flap depended on the patient's body type.(12)

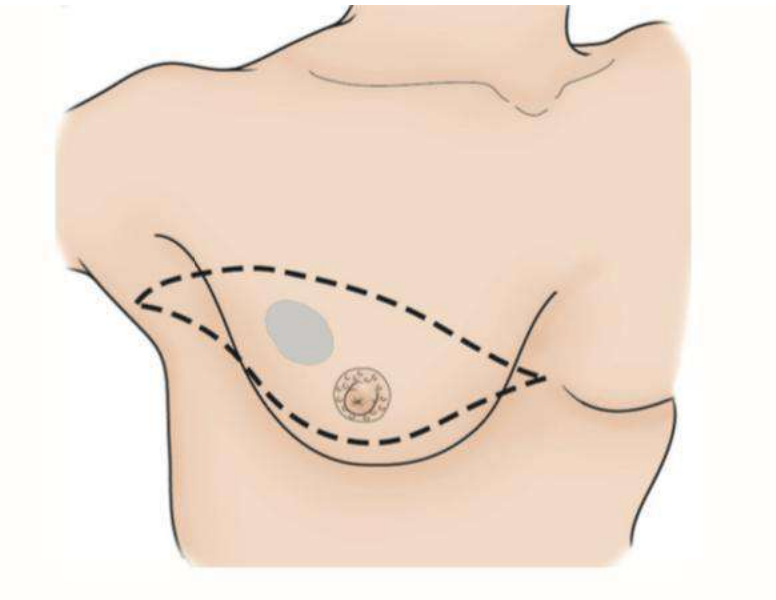


Image 6 : Classic stewart elliptical incision (12)

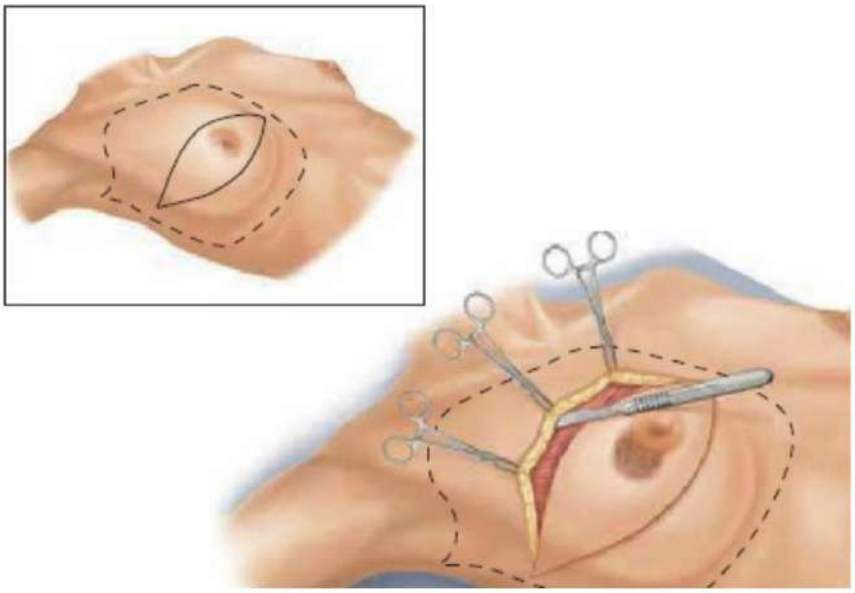


Image 7 : Limits of Modified Radical Mastectomy(12)

Dissection:

After raising the skin flap, the breast tissue, including the pectoralis fascia, was carefully separated from the underlying pectoralis major muscle. The pectoralis muscles, along with the breast tissue, received blood supply from perforating vessels of the lateral thoracic and anterior intercostal arteries. These vessels were encountered during the dissection and were identified and tied off with non-absorbable sutures (2-0 or 3-0). The inferolateral breast attachment was left intact initially to provide traction during the procedure. The latissimus dorsi muscle was followed along its anterior surface toward the upper regions. At this point, the intercostobrachial nerves were identified and preserved. As the dissection continued towards the axilla, the surgeon approached the axillary vein, which was carefully isolated and dissected without damage. The thoracodorsal neurovascular bundle and the long thoracic nerve were also preserved during this process. Finally, the remaining inferolateral attachments were excised using electrocautery.(12)

Drain placement and wound closure:

A suction drain with two limbs was placed to drain postoperative blood and seroma accumulation. One limb was inserted into the axilla to collect blood or seroma from the axillary space, while the other limb was placed in the wound bed between the skin flaps and the chest wall to drain any residual blood and serum. The drains were secured with sutures (2-0 silk). The wound was then closed in two layers: the subcutaneous layer with absorbable sutures (2-0 Vicryl) and the skin with non-absorbable sutures (2-0 Ethilon).(12)

After excision, the MRM specimen was sent for histopathological examination and the report was recorded in both groups

DATA COLLECTION

The following parameters were evaluated in both the study and control groups:

1. **Demographics and Patient Spectrum**: Demographic details and the spectrum of patients presenting with breast cancer at AIIMS, Bhopal were collected.
2. **Detailed Patient History**: This included comorbidities, history of radiation, and neoadjuvant chemotherapy.
3. **Clinical Examination**: A thorough clinical examination of the patients was conducted to assess the tumor size and axillary lymph node status. Clinical staging of pt
4. **Radiological Investigations**: Patients underwent preoperative sonomammography and CECT of the chest, abdomen, and thorax. Data were collected from these assessments.
5. **Core Needle Biopsy**:- Biopsy data was collected to determine the type of tumor and its molecular subtype based on ER, PR, HER2/neu, and Ki-67 status.
6. **Intraoperative Duration of surgery** was noted.
7. **Intraoperative Bleeding**: Blood loss during surgery was measured by assessing the number of soaked mops (by weighing them before and after use) and by subtracting the irrigation fluid from the volume of blood collected in the suction apparatus.
8. **Drain Output Measurement**: Drain output was measured daily from postoperative day 1 until day 7. The amount was quantified by emptying the drain into a 50 cc syringe and recording the total output each day. If the patient had more than 50 ml of drain output, they were discharged and followed up in the outpatient department (OPD) after one week.

9. **Drain Removal**: If the drain output is < 30 ml per day for 2 consecutive days, then the drain was removed. The day the drain was removed was noted- recording the duration of the drain's placement.

10. **Wound Infection**: Wound infection was classified using the Clavien-Dindo classification:

    - **Grade I**: Minor complications such as light inflammation, non-surgical hematoma, seroma formation, partial skin/NAC loss, limited fat necrosis, SSI, and lymphedema that do not require medication or surgical treatment.
    - **Grade II**: Grade I complications requiring medication or surgical interventions such as antibiotic therapy, re-suturing due to SSI, or multiple punctures for chronic seroma.
    - **Grade III**: Complications requiring invasive surgical intervention, such as hematoma evacuation, reoperation for chronic inflammation, severe fat necrosis, full skin/NAC necrosis, and wound dehiscence.
    - **Grade IV**: Complications leading to temporary organ failure.
    - **Grade V**: Complications resulting in death.

11. **Postoperative Flap Necrosis**: The percentage of flap necrosis was recorded and graded as follows:

- **Grade 0**: 0% necrosis (healthy flap).
- **Grade 1**: Less than 10% necrosis.
- **Grade 2**: 10–30% necrosis.
- **Grade 3**: 30–50% necrosis.
- **Grade 4**: More than 50% necrosis.

11. **Postoperative Seroma**: Postoperative seroma was measured using high-resolution ultrasonography (HRSG).
12. **Follow up:-** Patients will be evaluated in the outpatient clinic, 1 week and 2 weeks postoperatively for seroma assessment and surgery-related complications locally.

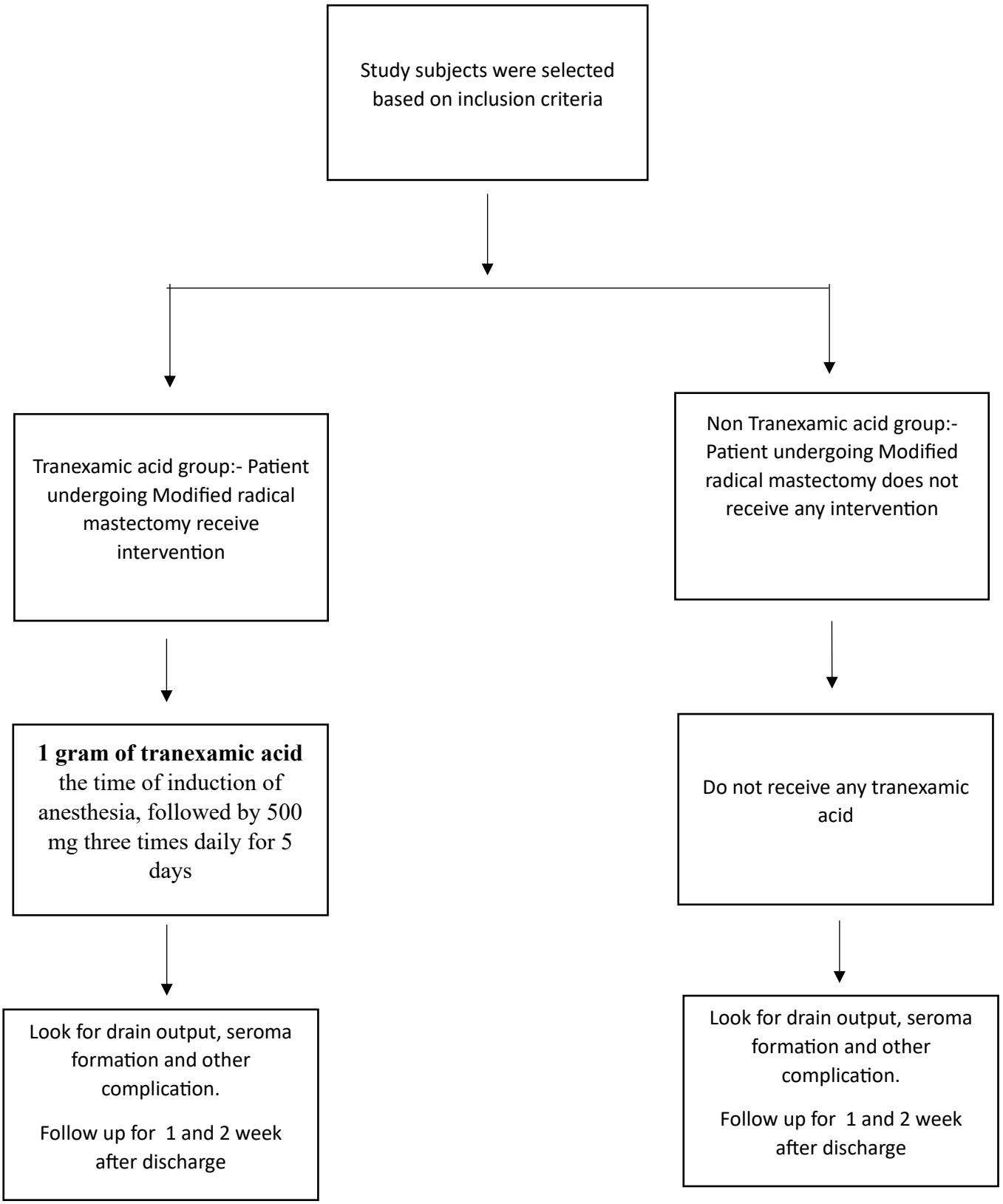
Statistical Analysis:-

The collected data was entered in Microsoft Excel and then analyzed and statistically evaluated using the SPSS-25 version.

The normality of each variable was assessed by using the Kolmogorov- Smirnov test.

Quantitative data was expressed by mean, standard deviation, and difference between the means of the two groups were tested by the Unpaired t-test or Mann Whitney U test, while Qualitative data were expressed in percentages, and the difference between the percentages of the two groups were tested by chi square test or Fisher exact test. 'P' value less than 0.05 would be considered statistically significant.

CONSORT DIAGRAM OF OUR STUDY


Study subjects were selected based on inclusion criteria
Tranexamic acid group:- Patient undergoing Modified radical mastectomy receive intervention
Non Tranexamic acid group:- Patient undergoing Modified radical mastectomy does not receive any intervention
1 gram of tranexamic acid the time of induction of anesthesia, followed by 500 mg three times daily for 5 days
Do not receive any tranexamic acid
Look for drain output, seroma formation and other complication.
Follow up for 1 and 2 week after discharge
Look for drain output, seroma formation and other complication.
Follow up for 1 and 2 week after discharge

ILLUSTRATIONS

Image 8 : Marking the incision site and the lumps

Image 9 : showing stewart elliptical incision

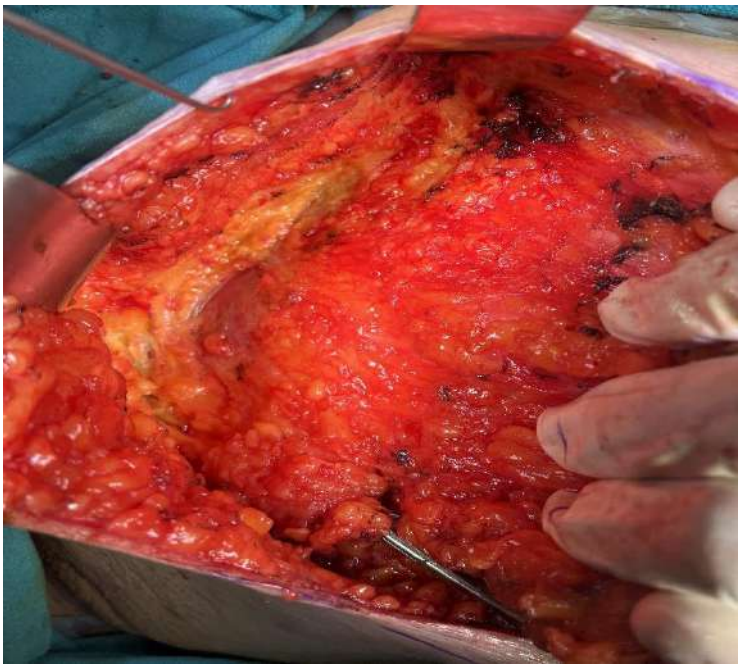


Image 10 : Raising of superior flap

Image 11: Raising of inferior flap

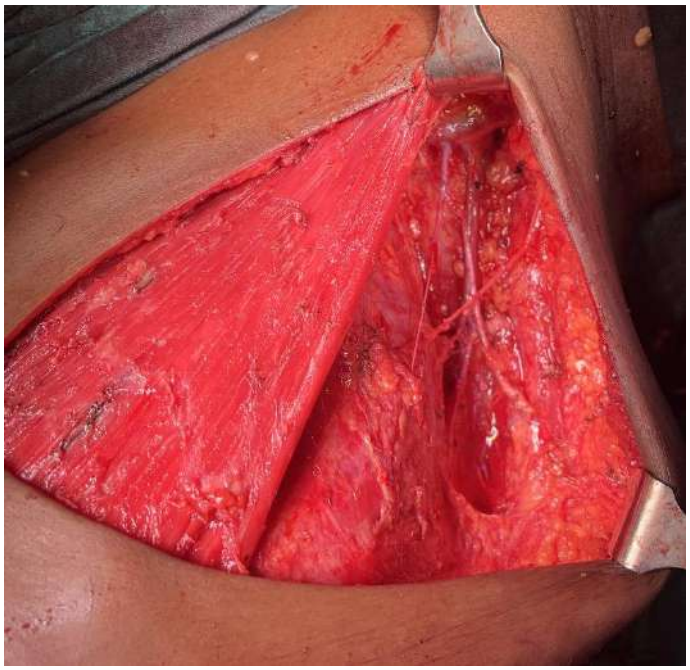


Image12 : Level 1 and 2 Axillary clearance

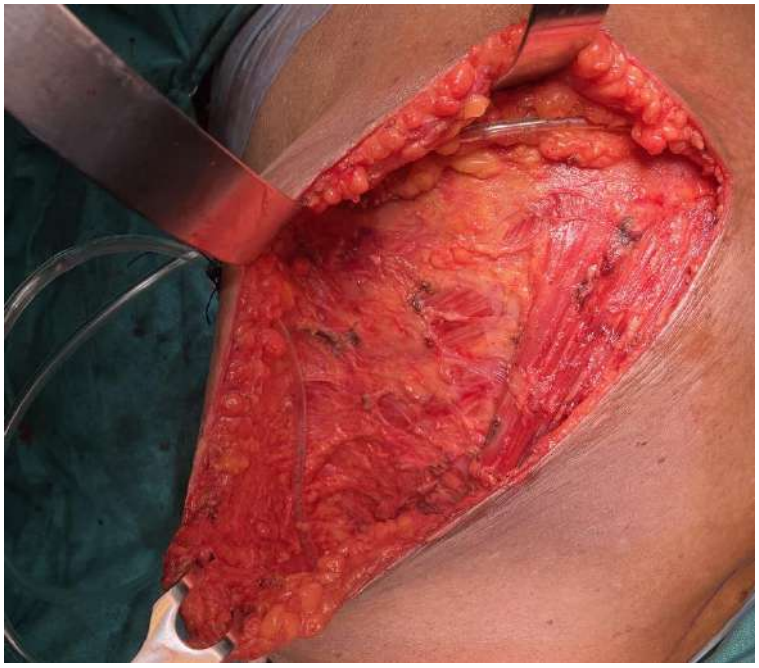


Image 13 : Two limbs of the drain – one in the axilla and the other below the flap and chest wall

Image 14: Closing of skin

Image 15 : MRM specimen

Image 16: Quantification of drain output

Image 17: Post op scar

Image 18 : Showing 12- 20 % flap necrosis

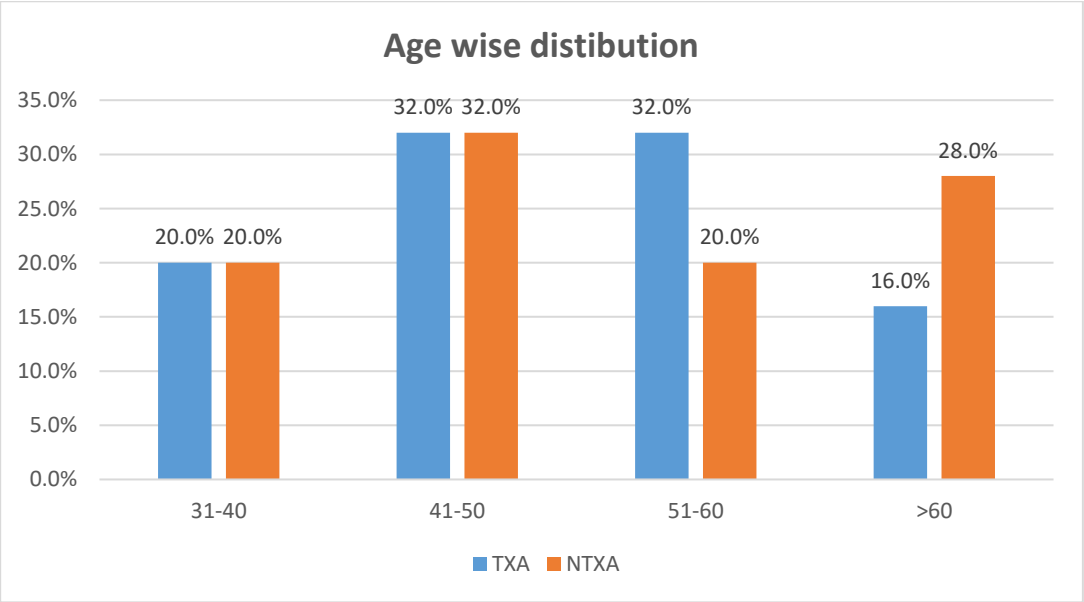
RESULTS

In this study, titled "A Prospective Study of the Role of Tranexamic Acid in Postoperative Bleeding and Seroma Formation," we investigated whether tranexamic acid impacts reducing postoperative bleeding and seroma formation. The study was conducted in the General Surgery department at AIIMS Bhopal from April 2022 to August 2023. A total of 50 patients who underwent Modified Radical Mastectomy (MRM) were divided into two groups—one group received tranexamic acid, and the other did not.

Table 1: Demography- Age distribution

AGE	TXA group	NTXA group	P
31-40	5 (20%)	5 (20%)	0.87
41-50	8 (32%)	8 (32%)	
51-60	8(32%)	5 (20%)	
>60	4 (16%)	7 (28%)	
Mean Age	51.40±11.20	51.88±10.87	

Graph 1: Age distribution



The TXA (Tranexamic acid group) and NTXA(Nontranexamic acid group) groups demonstrate comparable age distributions, with similar proportions in the 31-40 (20% vs 20%) and 41-50 (32% vs 32%) age groups, and minimal variations in the 51-60 (32% vs 20%) and >60 (16% vs 28%) groups. Additionally, the mean ages of the two groups are nearly identical, with TXA averaging 51.40 ± 11.20 years and NTXA averaging 51.88 ± 10.87 years (p=0.87), indicating no statistically significant difference. This suggests that age is well-matched between the two groups, providing a consistent baseline for comparison.

Table 2: BMI Distribution

BMI	**TXA group**	**NTXA group**	**P**
<18.5	2 (8%)	1 (4%)	0.96
18.5 – 24.9	17 68%)	19 (76%)	
25-29.9	6 (24%)	5 (20%)	
>30	0	0	
Mean BMI	22.90±2.52	22.87±2.42	

It is evident from the above table that the TXA and NTXA groups demonstrate similar BMI distributions, with comparable proportions in the underweight (<18.5; 8% vs 4%), normal weight (18.5-24.9; 68% vs 76%), and overweight (25-29.9; 24% vs 20%) categories, and no obese individuals (>30) in either group.

The mean BMI values are also nearly identical (TXA: 22.90 ± 2.52, NTXA: 22.87 ± 2.42), showing no statistically significant difference (p=0.96), indicating well-matched BMI between the two groups.

Graph 2: Mean Age and BMI distribution.

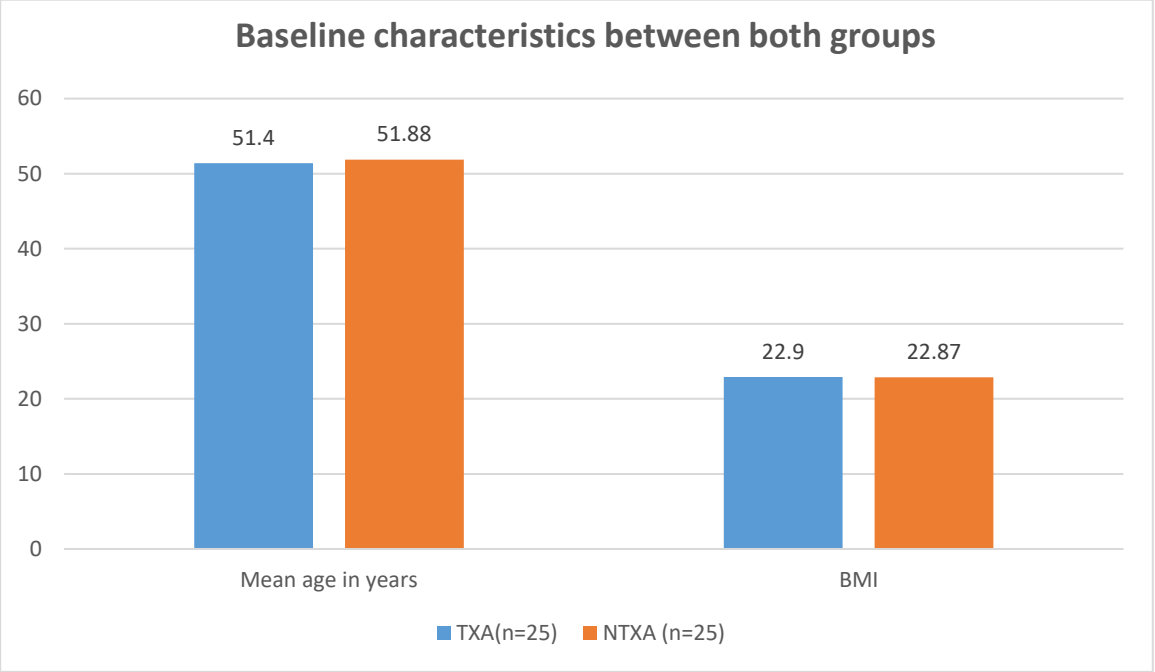


Table 3: Comorbidities

	TXA (n- 25)	%	NTXA (n- 25)	%	Total	%	p
HYPERTENSION	6	24	8	32	14	28	0.54
DIABETIES	3	12	5	20	8	16	0.43
HYPOTHYROIDISM	2	8	0	0	2	4	0.23
ASTHMA	1	4	0	0	1	2	0.50
HEART DISEASE	0	0	2	8	2	4	0.23

We found from the above table that hypertension was the most prevalent comorbidity, affecting 28% of the total population (14/50), with a slightly higher incidence in the NTXA group (32% vs. 24%, p-value 0.54). Diabetes was present in 16% of the total population (8/50), with a higher incidence in the NTXA group (20% vs. 12%, p-value 0.43). Hypothyroidism and asthma were relatively rare, affecting 4% (2/50) and 2% (1/50) of the total population, respectively, exclusively

in the TXA group. Heart disease was observed only in the NTXA group, affecting 8% (2/25) of patients. Comorbidities in both groups are comparable.

Graph 3: Comorbidities

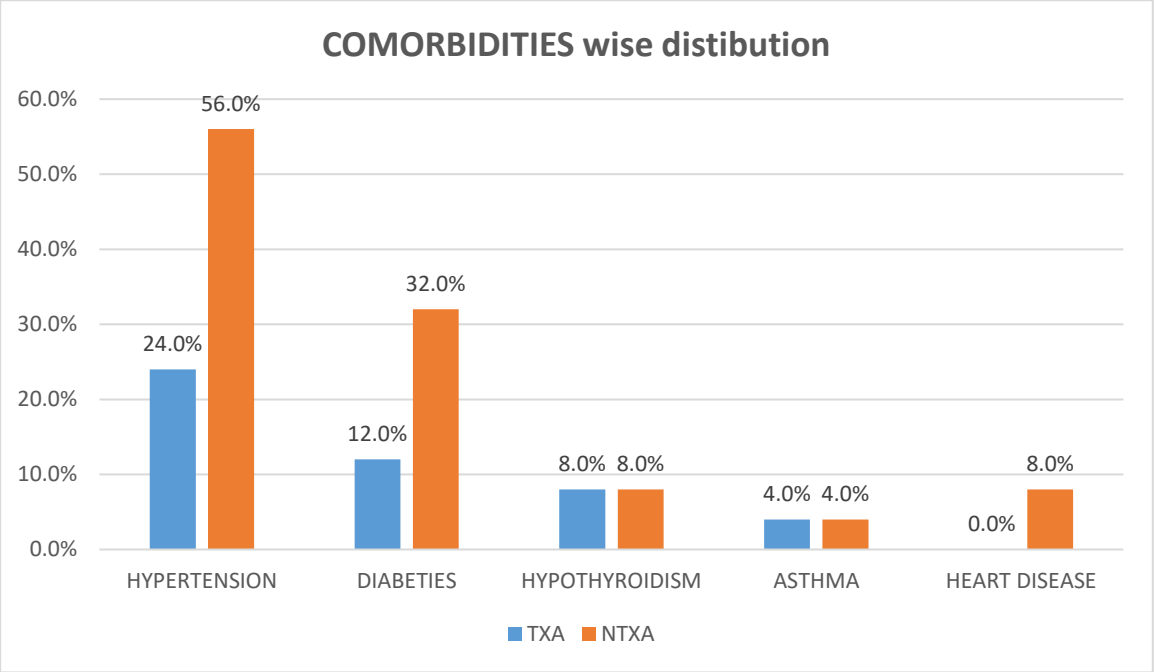


Table 4 : Site of Tumor

SIDE OF TUMOR	UOQ	UIQ	LOQ	LIQ	CENTRAL	NO LUMP
TXA	10(40)	5(20)	2(8)	2(8)	5(20)	1(4)
NTXA	6(24)	2(8)	2(8)	3(12)	10(40)	2(8)
Total (%)	32	14	8	10	30	6

The distribution of tumor locations in the Tranexamic Acid (TXA) and NTXA groups was analyzed. The results showed that the most common tumor locations were the Upper Outer Quadrant (UOQ) (32%) and Central (30%) regions. In the TXA group, 40% of tumors were located

in the UOQ, compared to 24% in the Control group. Conversely, the NTXA group had a higher proportion of Central tumors (40% vs. 20% in the TXA group). The remaining tumor locations, including the Upper Inner Quadrant (UIQ) (14%), Lower Outer Quadrant (LOQ) (8%), and Lower Inner Quadrant (LIQ) (10%), showed no significant differences between the groups. Notably, 6% of patients had no palpable lump.

Graph 4: Site of tumor

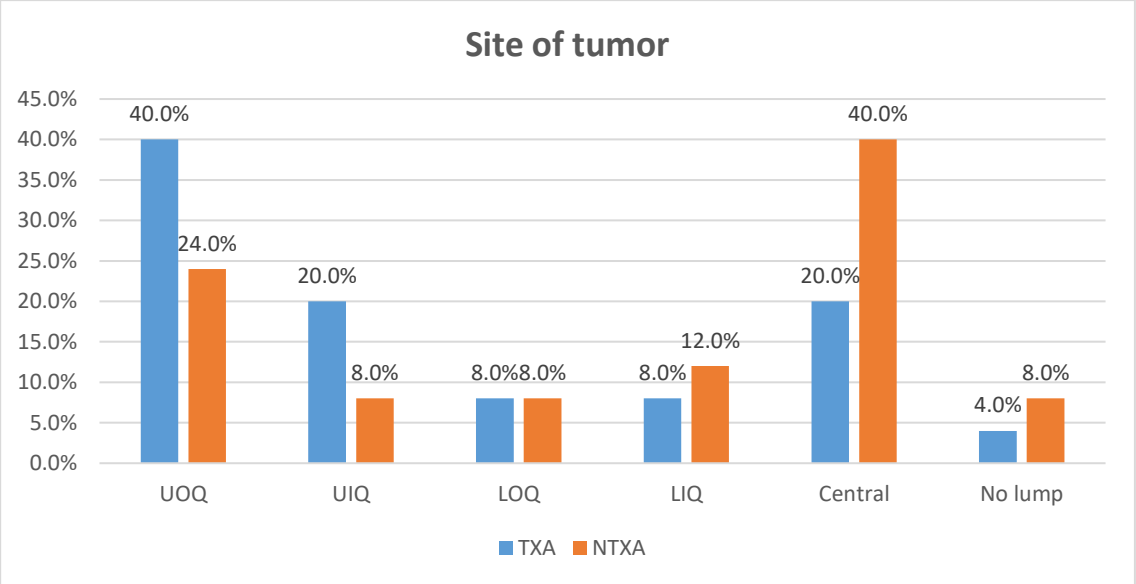
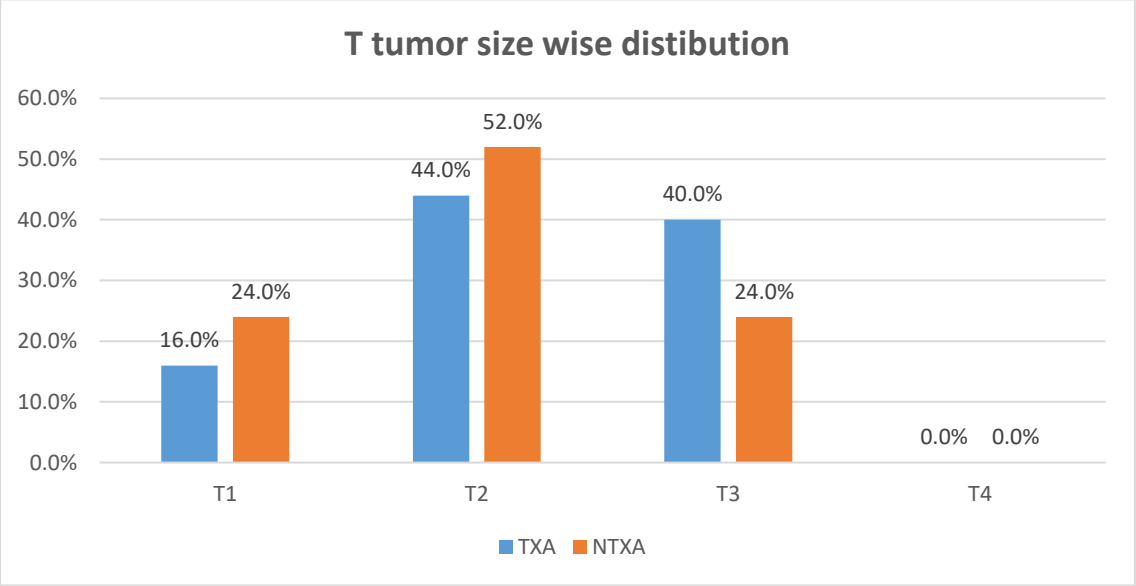


Table 5: T And N Status

TUMOR SIZE	TXA n(%)	NTXA n(%)	P	N STATUS	TXA n(%)	NTXA n(%)	P
T1	4(16)	6(24)	0.45	NO	18(72)	15(60)	0.80
T2	11(44)	13(52)	0.45	N1	4(16)	3(12)	0.73
T3	10(40)	6(24)	0.17	N2	2(8)	4(16)	0.40
T4	0	0		N3	1(4)	1(4)	1
TOTAL	25(100)	25(100)		TOTAL	25(100)	25(100)	

The present study compared the tumor size distribution T and N status between patients receiving tranexamic acid (TXA) and non-tranexamic acid (NTXA) groups. No significant differences were observed in tumor size distribution, with T1 (16% vs. 24%, p=0.45), T2 (44% vs. 52%, p=0.45), T3 (40% vs. 24%, p=0.17), and T4 (0% vs. 0%) showing comparable rates. Similarly, N status distribution showed no significant differences, with NO (72% vs. 60%, p=0.80), N1 (16% vs. 12%, p=0.73), N2 (8% vs. 16%, p=0.40), and N3 (4% vs. 4%, p=1.00) demonstrating equivalent proportions. Overall, most patients in both groups had T2 tumors (44% TXA, 52% NTXA) and NO N status (72% TXA, 60% NTXA), indicating no statistically significant differences between the TXA and NTXA groups.

Graph 5: T Stage Distribution



Graph 6: N Stage Distribution

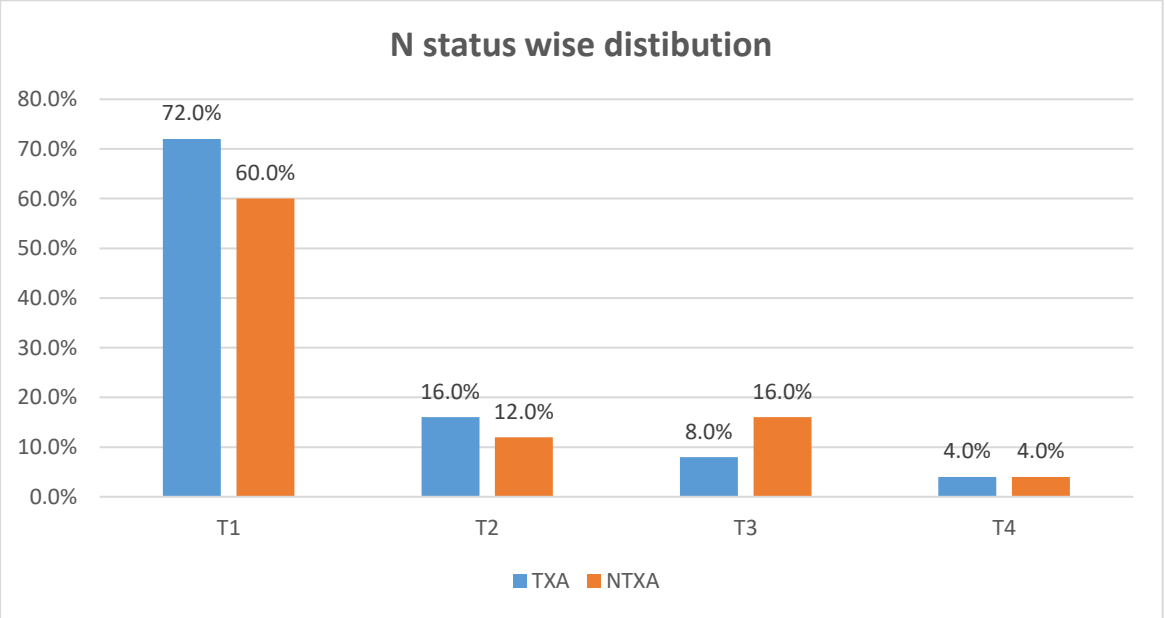
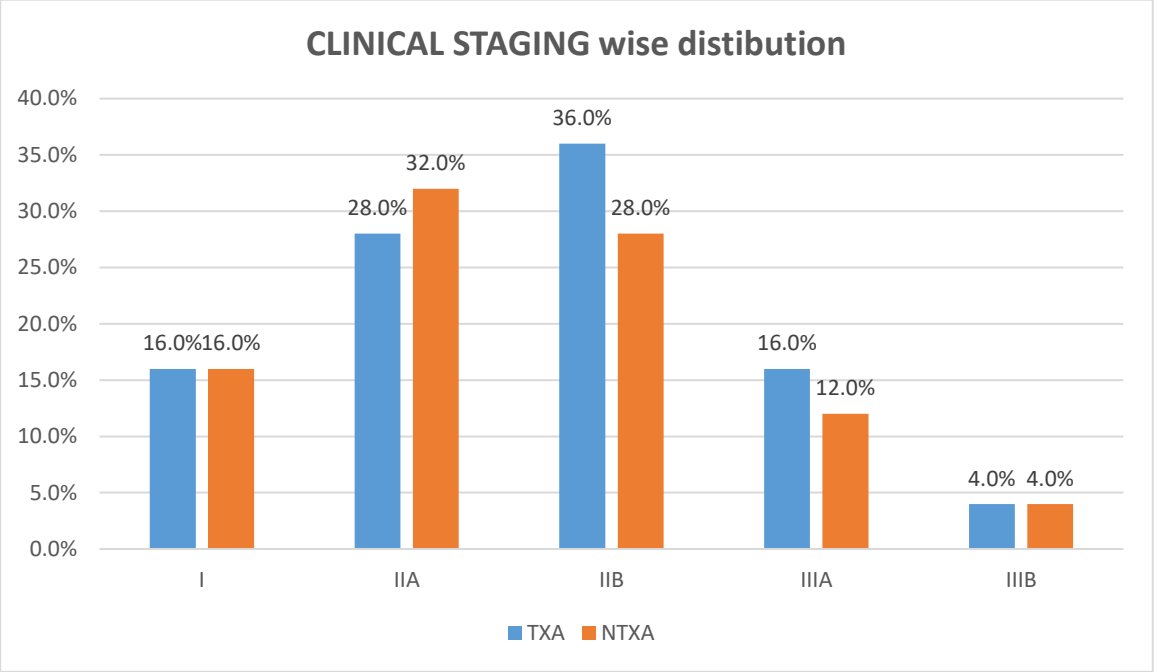


Table 6: Clinical Staging

CLINICAL STAGING	TXA n(%)	NTXA n(%)	P value
I	4(16)	5(20)	0.98
IIA	7(28)	8(32)	
IIB	9(36)	7(28)	
IIIA	4(16)	4(16)	
IIIB	1(4)	1(4)	
TOTAL	25(100)	25(100)	

Graph 7: Clinical Staging



The clinical staging data compares the distribution of breast cancer stages between the TXA group (receiving tranexamic acid) and the NTXA group (not receiving tranexamic acid). The findings indicate a similar distribution of cancer stages across both groups, suggesting comparability in the stage of disease at presentation. For instance, Stage I accounts for 16% in the TXA group and 20% in the NTXA group, while Stage IIIA is identical at 16%. Notably, the TXA group has a higher percentage (36%) of patients with Stage IIB compared to the NTXA group (28%). The calculated p-value of 0.98 suggests no statistically significant difference in the distribution of cancer stages between the two groups.

Table 7 : Comparing site of the tumor with stage

Quadrant	NTXA group (Stages)	TXA group (Stages)
Upper Outer Quadrant (UOQ)	6 cases (lIA, lIA, IIA, IIIA, I, IIA)	10 cases (lIB, 1, IIB, IIA, 1IB, 1, 1IB, IIIA, IIIA, 1IB)
Upper Inner Quadrant (UIQ)	2 cases (IIB, IIB)	5 cases (IA, lIA, lIA IIB, 1IB)
Central Quadrant	10 cases (IA, IIB, 1IB, I, IIIA, IB, 1IB, I, lIA, IIA)	5 cases (IA, IllA, IIIA, IIB, 1IB)
Lower Inner Quadrant (LIQ)	3 cases (IIB, IIIA, IIIA)	2 cases (IIA, IIB)
Lower Outer Quadrant (LOQ)	2 cases (lIB, IIIA)	2 cases (IIA, lIA)
No Lump	2 cases (1, 1)	1 case (1)

Upper Outer Quadrant (UOQ) is the most common location, but cases range across all stages, from **Stage I to IIIA**, supporting that UOQ tumors are often detected early but can also present in more advanced stages.

Central Quadrant and Upper Inner Quadrant: These locations tend to present in **later stages (IIA, IIB, IIIA)**, especially in the **Central Quadrant,** where Stage IIIA cases are frequent. This suggests delayed detection or more aggressive behavior in these quadrants.

Lower Quadrants (LIQ and LOQ): Tumors in these quadrants are less frequent but are found in **later stages (IIB, IIIA)**, likely due to challenges in early detection

Table 8: Molecular subtypes

MOLECULAR SUBTYPES	TXA group	%	NTXA group	%	Total
LUMINAL A	6	24	4	16	20
LUMINAL B	8	32	8	32	32
HER2	5	20	7	28	24
TNBC	3	12	4	16	14
Not done	3	12	2	8	10
TOTAL	25	100	25	100	100

The molecular subtype data shows a relatively balanced distribution between the TXA and NTXA groups. **Luminal A** accounts for 24% in the TXA group and 16% in the NTXA group, while **Luminal B** is evenly distributed at 32% in both groups, making it the most common subtype. **HER2-positive** is higher in the NTXA group (28%) compared to the TXA group (20%), while **Triple Negative Breast Cancer (TNBC)** is slightly more common in the NTXA group (16%) than the TXA group (12%). Testing was not done for 12% of TXA patients and 8% of NTXA patients. Overall, the molecular subtype distribution is comparable across both groups.

Graph 8: Molecular subtypes

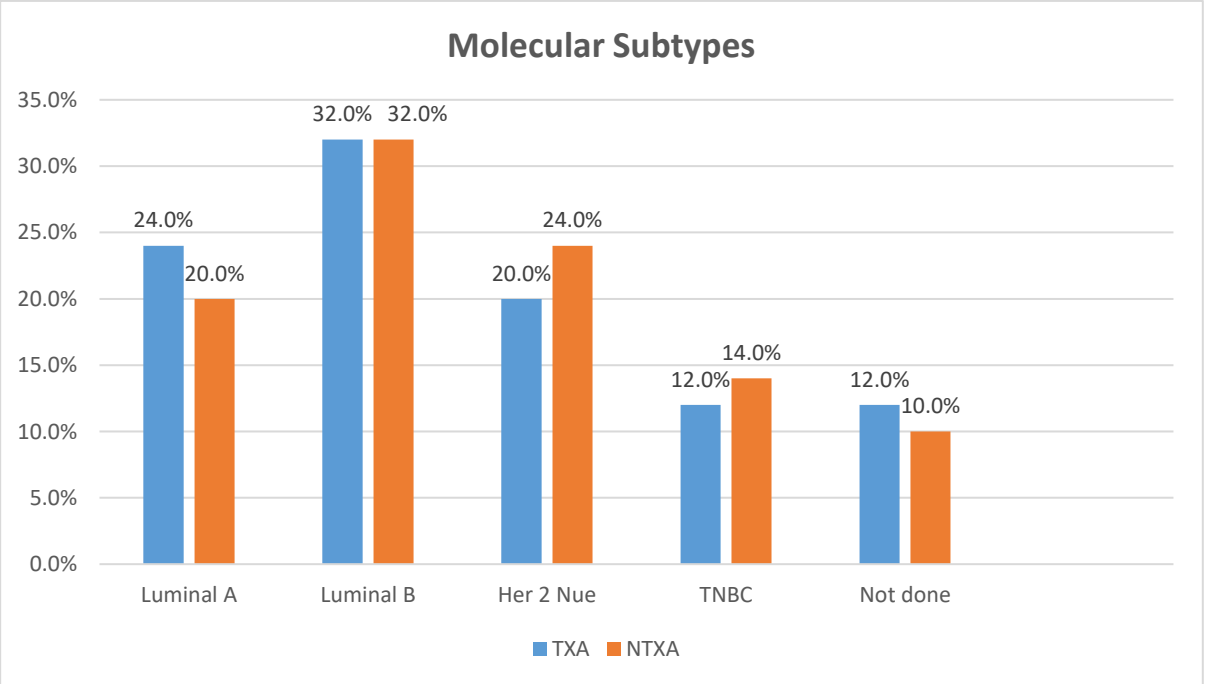


Table 9: Intraoperative Blood Loss

	INTRAOPERATIVE BLOOD LOSS		
RANGE	**TXA**	**NTXA**	**P**
<50 ML	1 (4%)	0	0.31
50 – 75ML	9 (36%)	5 (20%)	
76 – 100 ML	9 (36%)	7 (28%)	
101 – 125 ML	4 (16%)	8 (32%)	
126 – 150 ML	2 (8%)	3 (12%)	
>150 ML	0	2 (8%)	

The table compares intraoperative blood loss between the TXA and NTXA groups. A higher percentage of patients in the TXA group (4%) experienced blood loss of less than 50 ml compared to none in the control group. Most patients in both groups had blood loss between 50 and 100 ml (72% in the TXA group and 48% in the NTXA group). A larger proportion of TXA patients (32%) experienced blood loss in the range of 101-125 ml compared to 16% in the TXA group. Additionally, 8% of TXA group patients had blood loss greater than 150 ml, whereas no patients in the TXA group exceeded 150 ml. Despite these differences, the p-value of 0.31 suggests that the variation in blood loss between the two groups is not statistically significant. However, the data indicates a trend toward reduced blood loss in the TXA group, potentially highlighting the role of tranexamic acid in minimizing intraoperative bleeding.

Graph 9: Intraoperative Blood Loss

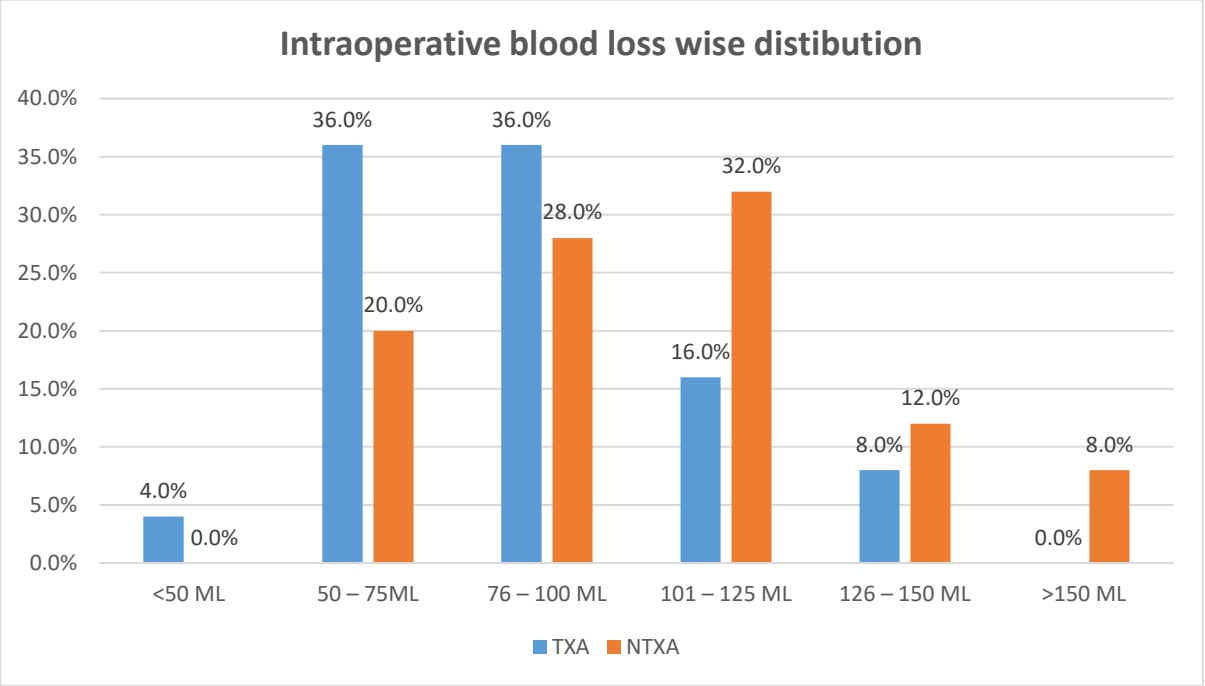


Table 10: Drain Output

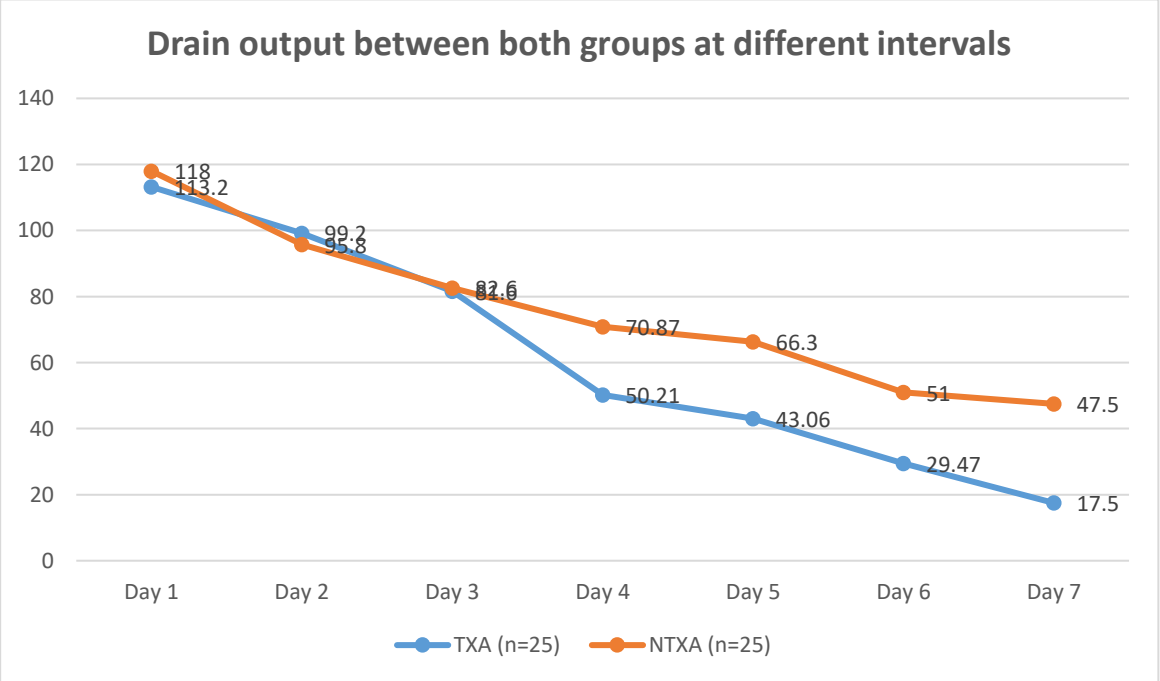
DRAIN OUTPUT	**TXA group(n=25)**	**NTXA group (n=25)**	
Day 1	113.2±54.67	118.0±81.03	0.72
Day 2	99.20±50.47	95.80±65.34	0.59
Day 3	81.60±50.94	82.60±71.80	0.61
Day 4	50.21±41.81	70.87±37.52	**0.03**
Day 5	43.06±44.33	66.30±50.99	**0.04**
Day 6	29.47±24.77	51.0±39.56	**0.02**
Day 7	17.50±7.90	47.50±32.84	**0.02**
Total drain output (ml)	500.71±227.25	662.14±377.18	0.33

The table compares the daily drain output between the TXA and NTXA groups for seven days. The results show that the drain output is similar between the groups for the first three days, with

no statistically significant difference (p-values of 0.72, 0.59, and 0.61, respectively). However, from Day 4 onward, there is a notable reduction in drain output in the TXA group compared to the NTXA group. On Day 4, the difference becomes significant (p=0.03), and this trend continues through Day 5 (p=0.04), Day 6 (p=0.02), and Day 7 (p=0.02). The consistent reduction in drain output in the TXA group during the later postoperative days suggests that tranexamic acid may help reduce seroma formation and overall drainage, potentially aiding in quicker recovery and earlier drain removal compared to the NTXA group.

The comparison of total drain output between the TXA (test) group and NTXA (control) group shows that the TXA group had a lower average total drain output (500.71 ± 227.25 ml) compared to the NTXA group (662.14 ± 377.18 ml). However, the p-value of 0.33 indicates that this difference is not statistically significant. This suggests that while the TXA group had a lower total drain output, the reduction is not large enough to be considered statistically significant based on this data.

Graph 10: Drain Output



Graph 11: Total Drain output

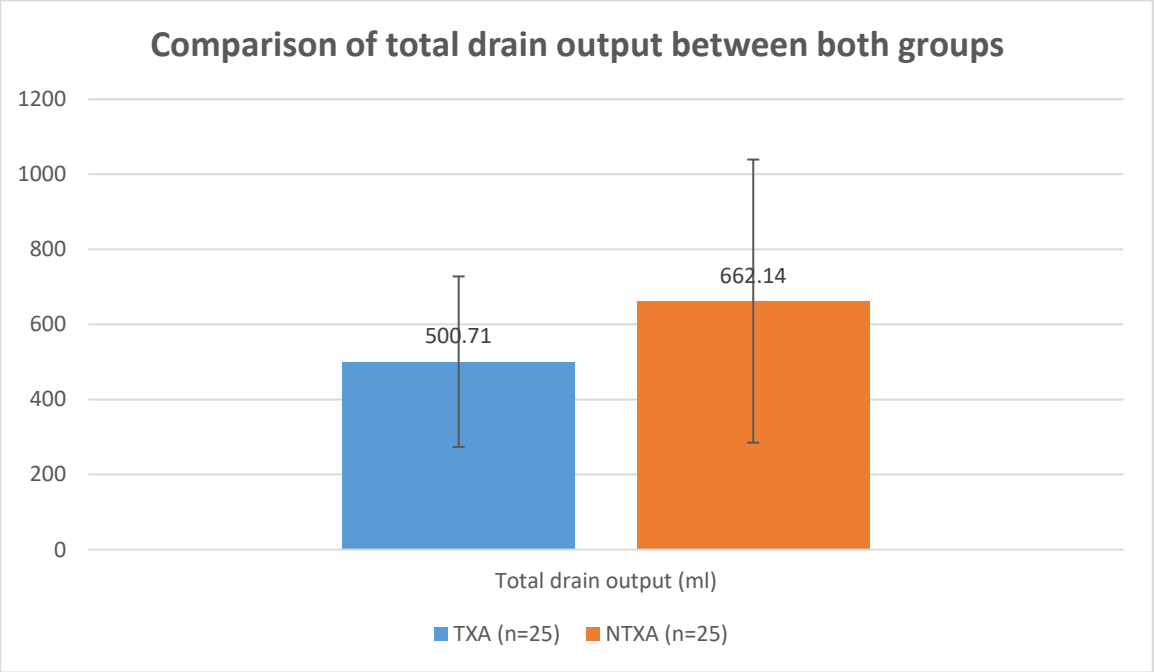
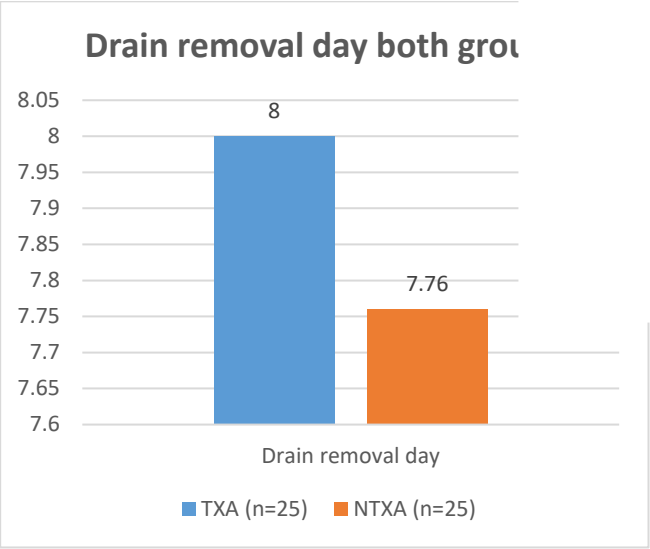


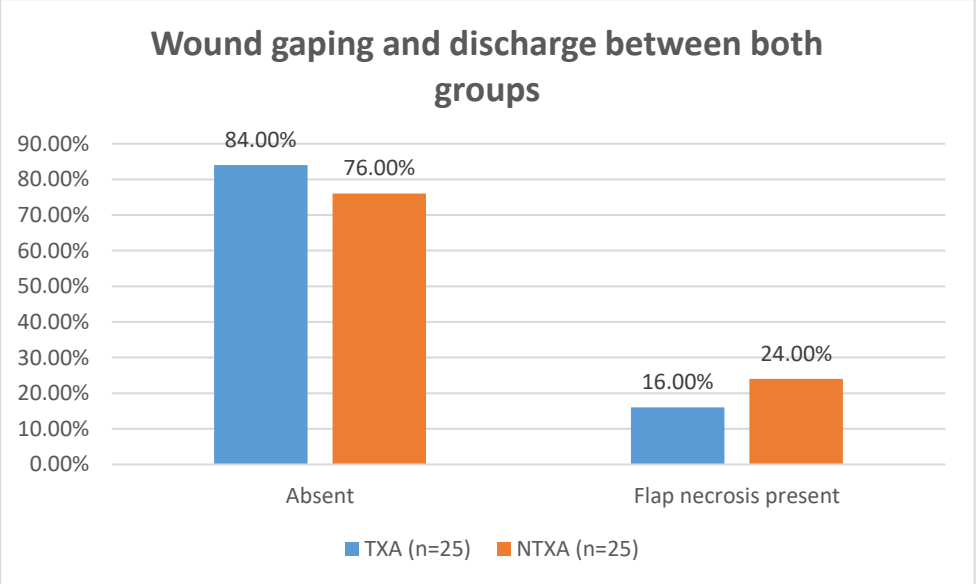
Table 11 : Post Operative Details

	Group		P value
	TXA (n=25)	**NTXA (n=25)**	
Duration of drain (mean , days)	8.0±3.34	7.76±3.87	0.36
Wound Gaping and Discharge			
Absent	21(84.0%)	19(76.0%)	0.72
Flap necrosis present	4(16.0%)	6(24.0%)	
Seroma after drain removal			
Absent	22(88.0%)	20(80.0%)	0.70
Present	3(12.0%)	5(20.0%)	

Graph 12: Duration of drain



Graph 13: Wound related complication

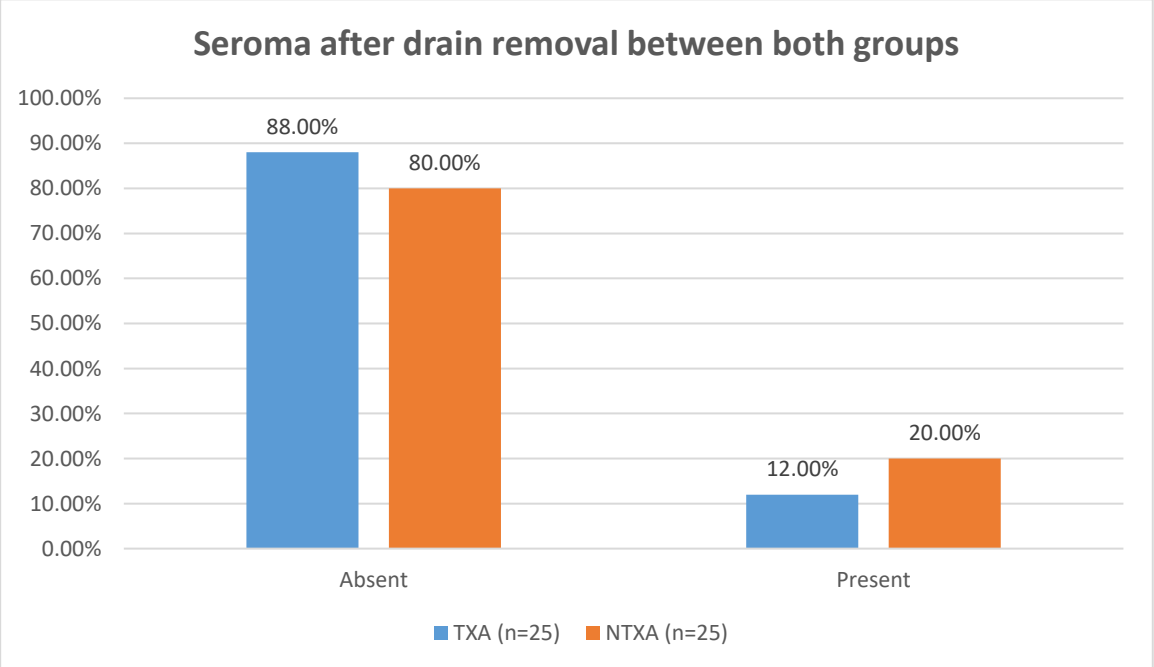


Postoperative outcomes, including drain removal time, wound gaping, discharge, and flap necrosis, were evaluated to assess the impact of tranexamic acid in patients undergoing Modified

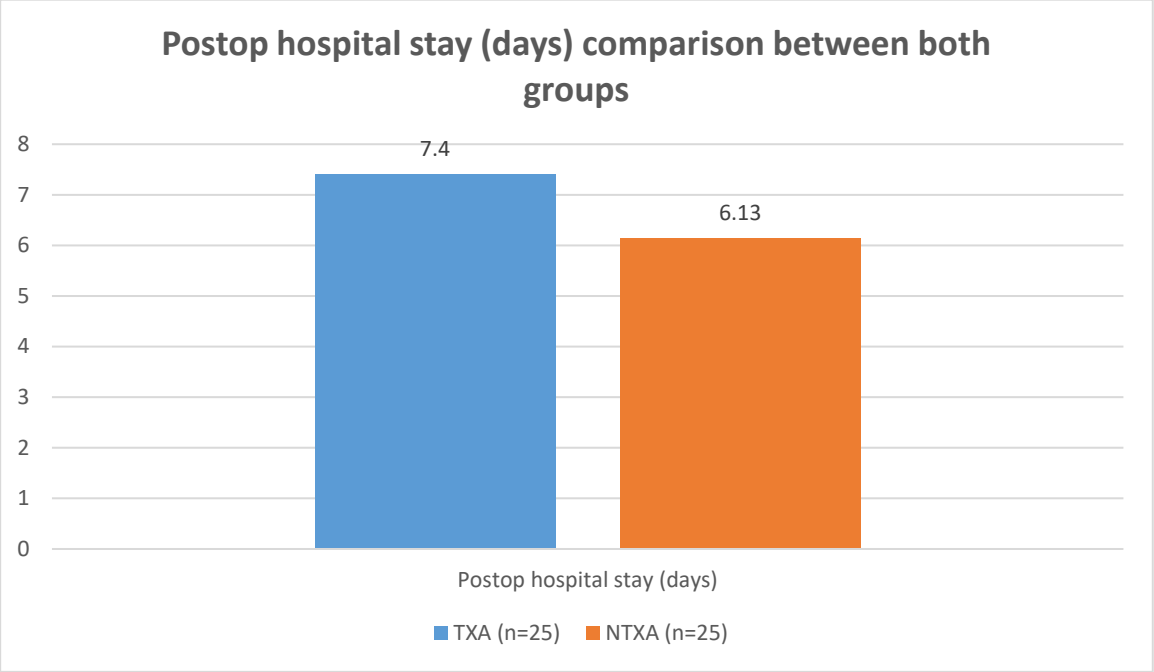
Radical Mastectomy (MRM). The mean time to drain removal was **8.0 ± 3.34 days** in the TXA group, compared to **7.76 ± 3.87 days** in the NTXA group, with a p-value of **0.36**, indicating no statistically significant difference between the two groups. Wound gaping and discharge were absent in **84.0%** of patients in the TXA group and **76.0%** in the NTXA group, yielding a p-value of **0.72**, which shows no significant association. Flap necrosis occurred in **16.0%** of the TXA group and **24.0%** of the NTXA group, suggesting a slightly higher incidence in the control group, though not statistically significant. Overall, tranexamic acid did not substantially alter these postoperative outcomes.

In the TXA group, seroma was absent in **88.0%** of patients, compared to **80.0%** in the NTXA group. Conversely, seroma was present in **12.0%** of the TXA group and **20.0%** of the NTXA group. The p-value for this comparison was **0.70**, indicating no statistically significant difference between the two groups. These results suggest that tranexamic acid did not substantially affect the incidence of seroma after drain removal.

GRAPH 14: Seroma after drain removal



Graph 15: Post op hospital stay



The mean hospital stay in the TXA group was **7.40 ± 1.84 days**, compared to **6.13 ± 2.29 days** in the NTXA group. The p-value was **<0.04**, indicating no statistically significant difference between the two groups.

Table 12: Histological Type:

	TXA	**%**	**NTXA**	**%**
INVASIVE DUCTAL CARCINOMA	24	96%	22	88%
INVASIVE LOBULAR CARCINOMA	0	0%	1	4%
GRANULOMATOUS DISEASE	1	4%	0	0%
NO RESIDUAL TUMOR	0	0%	2	8%
LYMPHOVASCULAR INVASION	6	24%	5	20%

In our study, invasive ductal carcinoma was the predominant histological type in both TXA (96%) and NTXA (88%) groups. Notably, no residual tumor was observed in the NTXA group post-neoadjuvant therapy.Granulomatous disease and invasive lobular carcinoma were rare entities, each accounting for 4% of the population

Graph 16: Histology of tumor

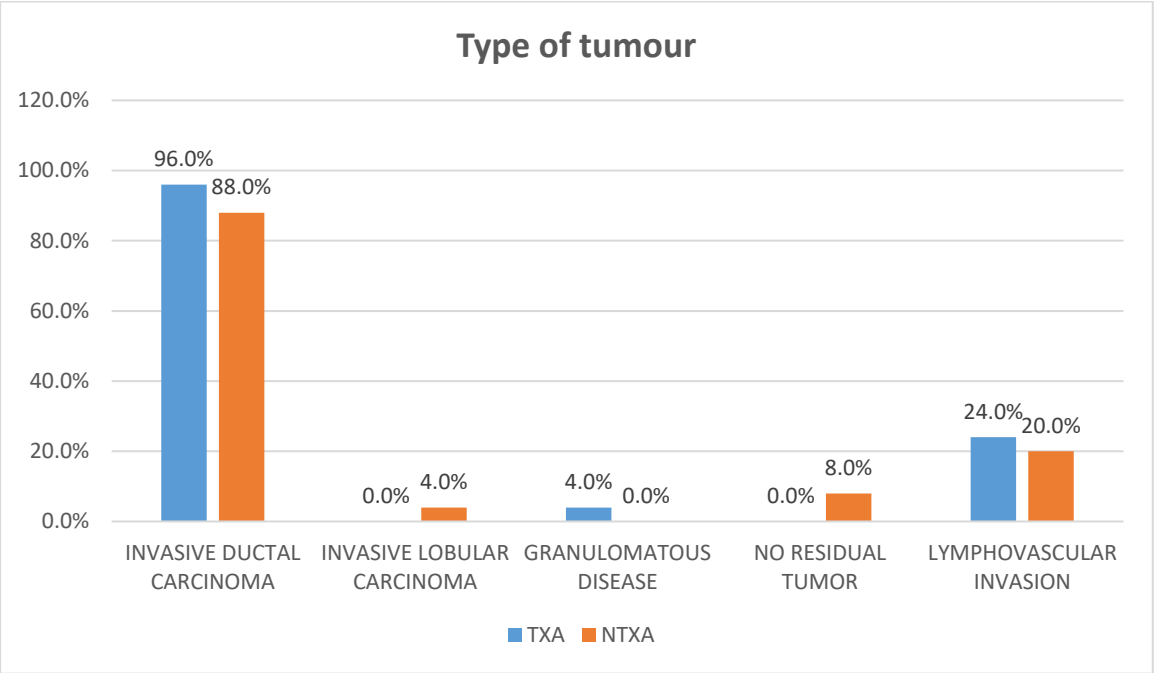


Table 13: Number of lymph nodes retrieved.

	TXA	%	NTXA	%
NO LYMPH NODES NOTED	0	0%	1	4%
1-5	2	8%	2	8%
6-10	8	32%	6	24%
11-15	9	36%	10	40%
>15	6	24%	6	24%
TOTAL	25	100%	25	100%

"Most patients undergoing Modified Radical Mastectomy (MRM) had 11-15 lymph nodes removed (TXA: 36%, NTXA: 40%). A smaller proportion had 6-10 nodes (TXA: 32%, NTXA: 24%) or more than 15 nodes (TXA: 24%, NTXA: 24%) removed."

Graph 17:Number of Lymph nodes retrieved

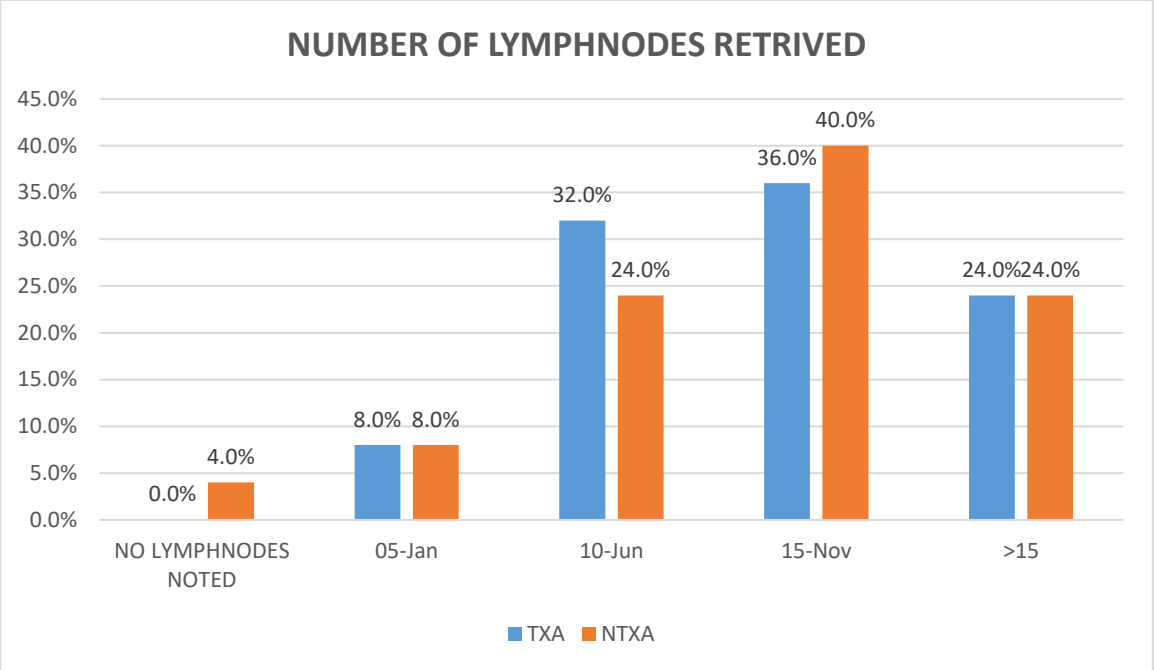
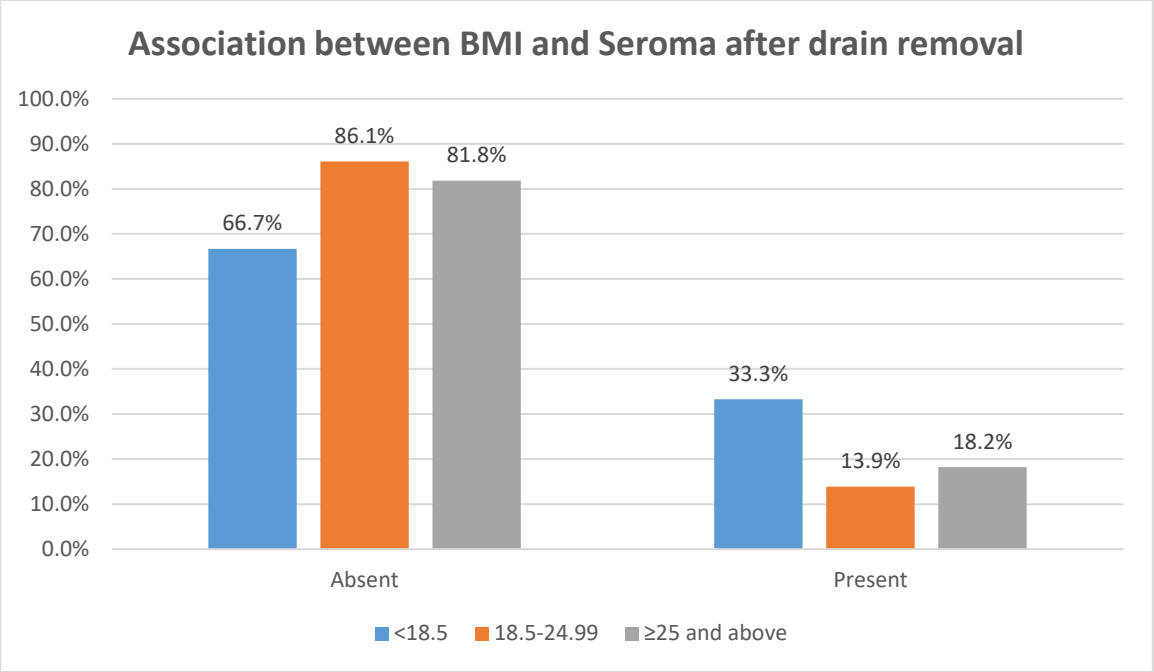


Table 14: Association between BMI and seroma after drain removal

	BMI			**P value**
Seroma after drain removal	**<18.5**	**18.5-24.99**	**≥25 and above**	
Absent	2 (66.7%)	31 (86.1%)	9 (81.8%)	0.66
Present	1 (33.3%)	5 (13.9%)	2 (18.2%)	

Graph 18: Association between BMI and seroma after drain removal



In the **underweight group (BMI <18.5)**, comprising three patients, **66.7%** (2 patients) did not develop seroma after drain removal, while **33.3%** (1 patient) experienced seroma. This higher seroma rate in the underweight group might suggest a potential vulnerability, although the small sample size limits the strength of this observation.

For patients in the **normal BMI range (18.5–24.99)**, which included 36 patients, **86.1%** (31 patients) did not develop seroma, whereas **13.9%** (5 patients) developed seroma. This suggests that the majority of patients with a normal BMI were less likely to experience seroma formation postoperatively, indicating that patients within this BMI range may have a reduced risk compared to the underweight group.

In the **overweight/obese group (BMI ≥25)**, which included 11 patients, **81.8%** (9 patients) were free of seroma, while **18.2%** (2 patients) developed seroma. Although the seroma rate was slightly

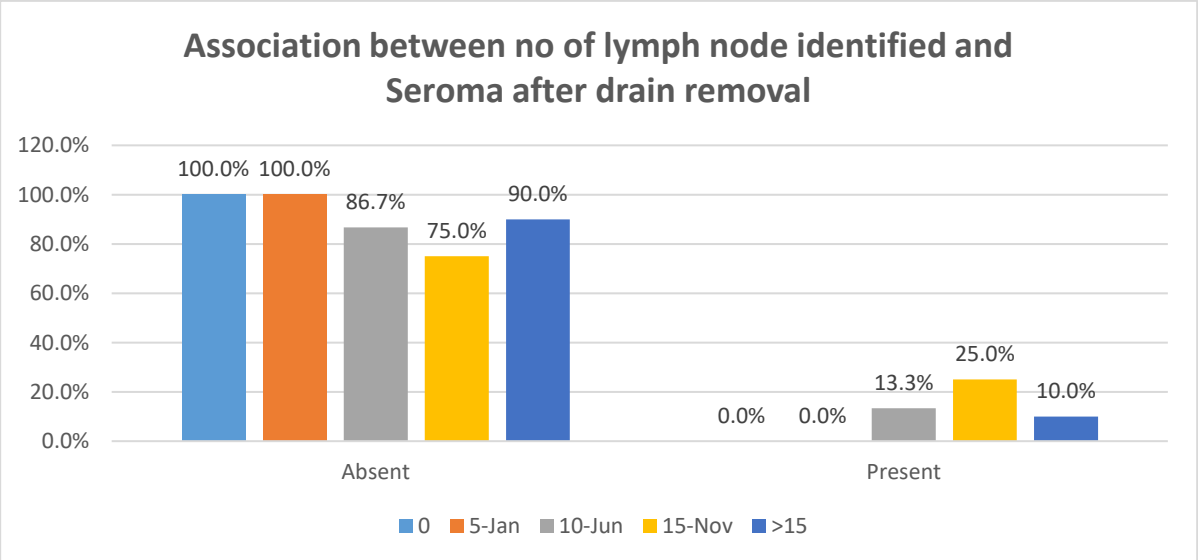
higher in this group compared to the normal BMI range, it was still lower than that of the underweight group.

The **p-value of 0.66** for these comparisons indicates that there was no statistically significant difference in the occurrence of seroma based on BMI. This suggests that, within this sample, BMI was not a strong predictor of seroma formation after drain removal. While there were slight variations in seroma rates between the different BMI categories, the results do not indicate a clear trend that would suggest a meaningful clinical difference linked to BMI.

Table 15: Association between no of lymph nodes identified and Seroma after drain removal

	Seroma after drain removal					P value
Number of lymph node identified	**0**	**1-5**	**6-10**	**11-15**	**>15**	
Absent	1 (100%)	4 (100%)	13 (86.7%)	15 (75%)	9 (90%)	0.64
Present	0	0	2 (13.3%)	5 (25%)	1 (10%)	

Graph 19:Association between the number of lymph nodes identified and Seroma after drain removal



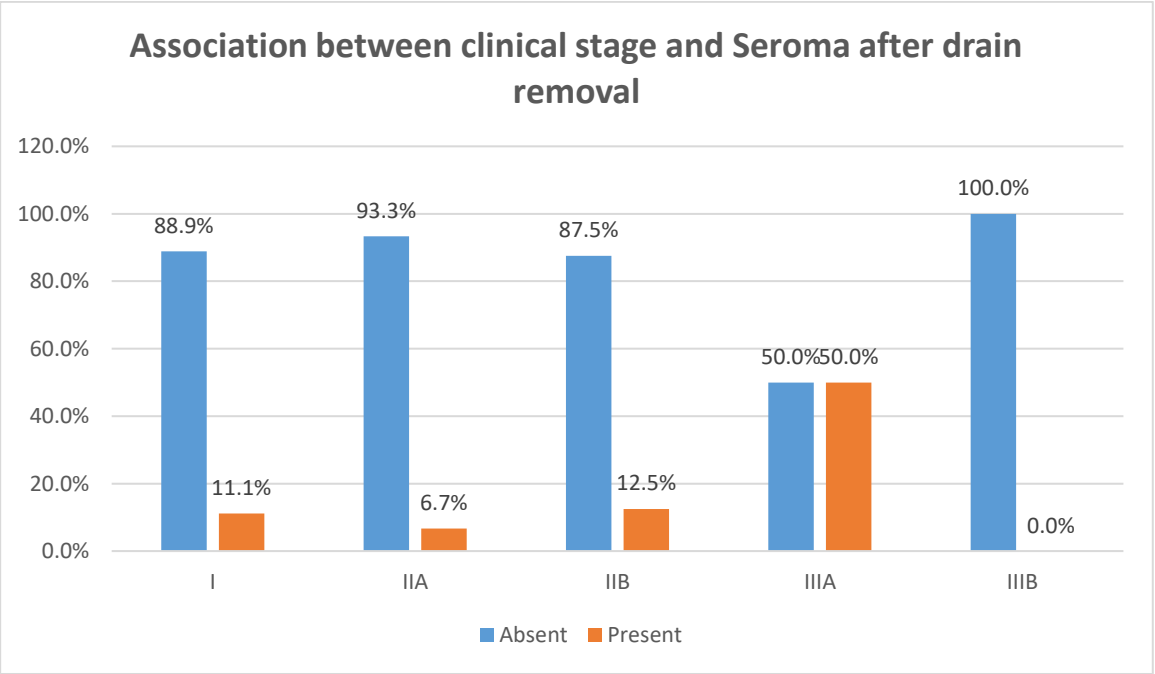
Seroma formation after drain removal was analyzed by lymph node count, revealing that most operated patients (n=20) fell into the 11-15 lymph nodes group, and showed the highest seroma presence rate (25%). Although no significant correlation existed between lymph node count and seroma formation (p=0.64), this group's large sample size and higher seroma incidence suggest increased risk. High seroma absence rates were observed in patients with 0, 1-5, and >15 lymph nodes. Close monitoring and targeted interventions may be necessary for patients with 11-15 lymph nodes, warranting further investigation with larger sample sizes to confirm these findings.

Table 16: Association between clinical stage and Seroma after drain removal

	Seroma after drain removal		**P value**
CLINICAL STAGING	**Absent**	**Present**	
I	8 (88.9%)	1 (11.1%)	0.04
IIA	14 (93.3%)	1 (6.7%)	
IIB	14 (87.5%)	2 (12.5%)	
IIIA	4 (50%)	4 (50%)	
IIIB	2 (100%)	0	

The analysis revealed a significant correlation between clinical staging and seroma formation after drain removal (p=0.04). Notably, early-stage patients (I, IIA, IIB) demonstrated high seroma absence rates (88-93%). Conversely, stage IIIA patients showed a substantial decline in seroma absence (50%) and a corresponding increase in seroma presence (50%). However, these findings should be interpreted with caution due to limited sample sizes, particularly in stage IIIB (n=2). A larger sample size is necessary to confirm these results and provide more reliable insights into seroma risk across clinical stages.

Graph 20: Association between clinical stage and Seroma after drain removal



DISCUSSION

DISCUSSION

Breast lumps are the most common pathology encountered by surgeons, with breast malignancy being a paramount concern. Consequently, surgery remains the primary treatment modality, with Modified Radical Mastectomy (MRM) being the most frequently performed procedure, particularly in countries like India. This is largely attributed to the fact that patients in these regions often present at advanced stages of the disease, necessitating more extensive surgical interventions. In contrast, Western countries typically report earlier disease presentation, allowing for less invasive treatment options. However, MRM's complications, including physical and psychological morbidity, flap necrosis, seroma formation, and lymphedema, pose significant concerns, underscoring the need for optimized surgical techniques and post-operative care, seroma being the most important one.

Numerous studies have investigated strategies to minimize seroma formation, and various methods have been proposed, including [list specific methods, e.g., "drainage techniques, fibrin sealants, and compression dressings"]. However, the efficacy and reliability of these approaches remain uncertain, with inconsistent results reported across studies, highlighting the need for further research to determine the most effective seroma reduction strategies.

Only a handful of studies have investigated the efficacy of tranexamic acid in reducing seroma formation following Modified Radical Mastectomy (MRM), highlighting a significant knowledge gap in this area. Our study evaluated tranexamic acid's role in reducing post-operative bleeding and seroma formation in patients undergoing MRM.

The study population was well-matched in both the tranexamic acid and non-tranexamic acid groups in terms of age, BMI, and clinical and radiological features.

Table 17: Age.

Authors	Year	Study design	N TXA/NTXA	Age(yr)(range) Mean ± SD		P value
				TXA group	NTXA group	
Weissler et al(51)	2021	Retro	257/128	40.2 ± 16.7	45.2 ± 16.1	0.006
Eldesouky et al(34)	2019	Pros	65/50	45.96 ± 7.06	47.87 ± 6.54	0.102
Lohani et al(50)	2019	Pros	47/46	49.7 ± 11.33	48.76 ± 10.42	0.67
Present Study	2023	Pros	25/25	51.40 ± 11.20	51.88 ± 10.87	0.87

Pros: Prospective, Retro: Retrospective

Age:-

In our study, the mean age was years in the tranexamic acid (TXA) group as compared to years in the non-tranexamic acid (NTXA) group with no statistical significance (P-0.87). The two groups were similar.

Similarly, in an Indian study conducted by **Lohani et al. (2019),** the mean age in the TXA group was 49 years as compared to 48 years in the NTXA group with no statistical significance (p=0.67). (49)

In the study of **Weissler et al. (2021)** the tranexamic acid group was 40 years as compared to 45 years in the non-tranexamic acid group with significant statistical significance (p=0.006). (51)

Table 18 : BMI

Authors	Year	Study design	N TXA/NTXA	BMI		P value
				TXA group	NTXA group	
Weissler et al(51)	2021	Retro	257/128	32 ± 5.3	36 ± 5.2	0.006
Eldesouky et al(34)	2019	Pros	65/50	32.4±3.04	33.02±2.39	0.089
Present Study	2023	Pros	25/25	22.90 ± 2.52	22.87 ±2.42	0.96

Pros: Prospective, Retro: Retrospective

BMI:

Weissler et al. (2021) found in their study a BMI of 32 in TXA and 36 in the NTXA acid group with a p-value of 0.006 which is statistically significant(51), whereas **Eldesouky et al. (2019)** found to be 32 and 33 in TXA and NTXA group respectively with an insignificant p-value.(34)

of 0.089.

In our study, BMI between the TXA and NTXA group was found to be 22, which is statistically insignificant with a p-value of 0.9

Table 19: Site of tumor

SIDE OF TUMOR	**UOQ**	**UIQ**	**LOQ**	**LIQ**	**CENTRAL**	**NO LUMP**	**Total**
Rummel et al (52)	520(53)	158(16)	143(15)	82(8)	107(11)	0	980
Present Study	16(32)	7(14)	4(8)	5(10)	15(30)	1(6)	50(100)

Site of tumor:

A study conducted by **Rummel et al. (2015)** found that Tumour location in the UOQ (51.5%) was significantly higher than in the UIQ (15.6%), LOQ (14.2%), central (10.6%), or LIQ (8.1%). (51)

Our present study found the following tumor location distribution: Upper Outer Quadrant (UOQ) (16, 32%), Upper Inner Quadrant (UIQ) (7, 14%), Lower Outer Quadrant (LOQ) (4, 8%), Lower Inner Quadrant (LIQ) (5, 10%), Central (15, 30%), and No Lump (3, 6%).

The tumor location distribution varies between **Rummel et al.'s** and our present studies. While both studies show a higher incidence of tumors in the Upper Outer Quadrant (UOQ), Rummel et al. reported a significantly higher UOQ proportion (53% vs. 32%)(51). Conversely, our study had a higher proportion of Central tumors (30% vs. 11%). The distribution of tumors in the Upper Inner Quadrant (UIQ), Lower Outer Quadrant (LOQ), and Lower Inner Quadrant (LIQ) was relatively similar between the two studies. These differences may be attributed to variations in population demographics, screening practices, or genetic factors.

Comparison of the site of the tumor with the stage of the disease:

Our study found that **Central Quadrant and Upper Inner Quadrant** tumors tend to present in **later stages (IIA, IIB, IIIA)**, especially In the **Central Quadrant** where Stage IIIA cases are frequent. This suggests delayed detection or more aggressive behavior in these quadrants.

Rummel et al. (2015), Conducted on tumor location within the breast, found that Tumours in the central quadrant were significantly more likely to have higher tumor stage ($P = 0.003$) and size ($P < 0.001$), metastatic lymph nodes ($P < 0.001$), and mortality ($P = 0.011$).

Table 20: T-stage comparison

Authors	**Year**	**Study design**	**N TXA/ NTXA**	**T1**			**T2**		
				TXA group	**NTXA group**	**P value**	**TXA group**	**NTXA group**	**P value**
Eldesouky et al(34)	2019	Pros	65/50	39 (60)	31 (68)	0.109	26 (40)	19 (32)	0.093
Present Study	2023	Pros	25/25	4(16)	6(24)	0.45	1144)	13(52)	0.45

Pros: Prospective

The analysis of disease stage distribution in breast cancer surgery patients reveals distinct geographical variations. Studies from Western countries, such as **Eldesouky et al. (2019),** show that patients tend to present earlier, with a higher proportion of T1 stage disease (TXA: 60%, NTXA: 68%) and lower T2 stage incidence (TXA: 40%, NTXA: 32%). In contrast, our present study (2023) indicates delayed presentation, with a higher percentage of patients in the T2 stage (TXA: 44%, NTXA: 52%) and lower T1 stage incidence (TXA: 16%, NTXA: 24%). These differences suggest variations in healthcare access, screening practices, and awareness between Western countries and our study setting. (34)

Table21: Neoadjuvant chemotherapy

Authors	**Year**	**Study design**	**N TXA/NTXA**	**NEOADJUVANT CHEMOTHERAPY**		**P value**
				TXA group	**NTXA group**	
Eldesouky et al(34)	2019	Pros	65/50	16	11	0.102
Lohani et al(50)	2019	Pros	47/46	23	24	0.75
Present Study	2023	Pros	25/25	8	16	0.029

Pros: Prospective, Retro: Retrospective

Neoadjuvant chemotherapy

Eldesouky et al. (2019) included 65 TXA and 50 NTXA patients, with 16 TXA and 11 NTXA patients receiving neoadjuvant chemotherapy (p = 0.102), showing no significant difference(34). **Lohani et al. (2019)** studied 47 TXA and 46 NTXA patients, with 23 TXA and 24 NTXA patients receiving neoadjuvant chemotherapy (p = 0.75), also indicating no significant difference(49). In

contrast, the **Present Study (2023)**, with 25 TXA and 25 NTXA patients, found a significant difference (p = 0.029), with fewer TXA patients (8) receiving neoadjuvant chemotherapy compared to NTXA patients (16). This suggests a statistically significant variation in the current study, unlike the earlier ones.

The significantly higher proportion of patients receiving neoadjuvant chemotherapy in the non-TXA group (64%, 16/25) compared to the TXA group (32%, 8/25) (p = 0.029) suggests that patients in the non-TXA group may have presented with more advanced malignancies, necessitating preoperative chemotherapy. This disparity highlights potential differences in disease severity between the two groups, which may confound the primary analysis of post-operative seroma formation. The association between advanced disease stage and post-operative seroma formation remains unclear.

Table 22: Total drain output

Authors	**Year**	**Study design**	**N TXA/NTXA**	**TOTAL DRAIN OUTPUT**		**P value**
				TXA group	**NTXA group**	
Eldesouky et al(34)	2019	Pros	65/50	798 ± 107.3	1067.1 ± 188.6	0.308
Present Study	2023	Pros	25/25	500.71±227.25	662.14±377.18	0.33

Pros: Prospective

Total drain output:

A study conducted by **Eldesouky et al**. in 2019 involved 65 patients receiving TXA and 50 patients receiving non-TXA, with mean wound drainage volumes of 798 ± 107.3 ml and 1067.1 ± 188.6 ml, respectively (p = 0.308). Despite the numerical difference, the results did not reach statistical significance.(34)

The **present study (2023),** with a smaller sample size of 25 patients in each group, found that the TXA group had a lower mean wound drainage volume (500.71 ± 227.25 ml) compared to the non-TXA group (662.14 ± 377.18 ml). Although the TXA group showed reduced drainage, the difference was not statistically significant ($p = 0.33$), likely due to the small sample size. This suggests that while TXA may benefit from reducing wound drainage, a larger sample size is necessary to confirm this finding.

In summary, both studies indicate that TXA does not provide a statistically significant reduction in wound drainage. However, the present study's trends suggest potential benefits of TXA, warranting further investigation with larger sample sizes.

In contrast to this study conducted by **Lohani et al. (2019),** The study's drain volume findings showed significant differences between the Tranexamic Acid (TXA) and Non-TXA groups. In the TXA group, the 25th percentile was 88 ml, the median (50th percentile) was 440 ml, and the 75th percentile was 1990 ml. In contrast, the Non-TXA group had a 25th percentile of 125 ml, a median of 715.5 ml, and a 75th percentile of 1914 ml.

The TXA group's median drain volume was 38.5% lower than the Non-TXA group. Furthermore, the 75th percentile drain volume in the TXA group was 55.6% lower than the non-TXA group. These findings indicate that TXA administration significantly reduces drain volume, with the greatest impact on patients with higher drain volumes.(49)

Another study conducted by **Ausen et al. (2019)** investigated the effectiveness of topical application of Tranexamic Acid (TXA) in reducing drain production after mastectomy. The primary outcome revealed a significant reduction in drain production within the first 24 hours, with a mean difference of -39 mL (95% CI: -69 to -14, p=0.001) in favor of TXA. This indicates that TXA effectively minimizes postoperative fluid loss.

Regarding total drain production, TXA demonstrated a mean reduction of -46 mL (95% CI: -81 to -18, p=0.001) compared to placebo. This statistically significant reduction underscores TXA's efficacy in decreasing overall drain volume.(53)

Table 23: Duration of drain

Authors	Year	Study design	N TXA/NTXA	DURATION OF DRAIN		P value
				TXA group	NTXA group	
Eldesouky et al(34)	2019	Pros	65/50	9.85 ± 1.66	11.67±1.9	<0.005
Weissler et al(51)	2021	Retro	257/128	6.5 ± 2.3	7.3 ± 4.5	0.1
Present Study	2023	Pros	25/25	8.0 ± 3.34	7.7 6± 3.87	0.36

Pros: Prospective

Duration of drain:

Eldesouky et al. (2019) conducted a prospective study with 65 TXA and 50 non-TXA patients, finding a significant reduction in drain duration with TXA (9.85 ± 1.66 vs. 11.67 ± 1.9 days, $p < 0.005$). (34)

In contrast, **Weissler et al.'s (2021)** retrospective study involving 257 TXA and 128 non-TXA patients showed no significant difference (6.5 ± 2.3 vs. 7.3 ± 4.5 days, $p = 0.1$). (50)

The **Present Study (2023),** a prospective investigation with 25 TXA and 25 non-TXA patients, reported a non-significant trend towards reduced drain duration with TXA (8.0 ± 3.34 vs. 7.76 ± 3.87 days, $p = 0.36$). These mixed results highlight the need for further research to confirm TXA's efficacy in minimizing drain duration.

A study conducted by **Ausen et al. (2019) examined the** impact of Tranexamic Acid (TXA) on drain duration after surgery. In simple mastectomy/SNB patients (n=137), TXA reduced drain duration by 11.6 days (95% CI: -24.9 to -0.2), with a borderline significant p-value of 0.054.

In axillary clearance patients (n=65), TXA showed a non-significant reduction of 23 days (95% CI: -65 to 9) in drain duration, with a p-value of 0.166.(52)

A significant difference was observed in drain removal time between the two groups. In a study conducted by **Lohani et al. (2019),** the TXA group (N=47) had a median drain removal time of 8 postoperative days (range: 3-34), whereas the non-TXA group (N=46) had a median removal time of 11 postoperative days (range: 4-30). This difference was statistically significant (p=0.046). (49)

Table 24: Seroma after drain removal

Authors	**Year**	**Study design**	**N TXA/NTXA**	**SEROMA AFTER DRAIN REMOVAL**		**P value**
				TXA group	**NTXA group**	
Eldesouky et al(34)	2019	Pros	65/50	8 (12.3)	6(12)	0.508
Weissler et al(51)	2021	Retro	257/128	10(2)	5(2)	0.94
Lohani et al(50)	2019	Pros	47/46	9(19.1)	15(32.6)	0.13
Present Study	2023	Pros	25/25	3(12)	5(20)	0.70

Seroma after drain removal:

Eldesouky et al. (2019) conducted a prospective study of 115 patients (65 TXA, 50 NTXA), finding no significant difference in seroma rates (12.3% TXA vs. 12% NTXA, p=0.508)(34). Similarly, **Weissler et al. (2021)** retrospectively analyzed 385 patients (257 TXA, 128 NTXA), reporting identical seroma rates (2% TXA vs. 2% NTXA, p=0.94). These findings suggest that TXA may not significantly impact seroma formation.(50)

However, **Lohani et al. (2019)** reported a trend toward reduced seroma rates with TXA (19.1% vs. 32.6%, p=0.13) in their prospective study of 93 patients (47 TXA, 46 NTXA). This contradicts the previous studies, hinting at TXA's potential benefits. Conversely, the Present Study (2023) found no significant difference (12% TXA vs. 20% NTXA, p=0.70) in their prospective analysis of 50 patients (25 TXA, 25 NTXA).(49)

Table 25: Wound-related complications

Authors	**Year**	**Study design**	**N TXA/NTXA**	**WOUND RELATED COMPLICATIONS**		**P value**
				TXA group	**NTXA group**	
Eldesouky et al(34)	2019	Pros	65/50	3 (4.6)	1(2)	0.790
Weissler et al(51)	2021	Retro	257/128	17(2.2)	14(2.7)	0.94
Lohani et al(50)	2019	Pros	47/46	2(4.3)	4(8.7)	0.13
Ausen et al(53)	2019	Pros	52/56	5(9.6)	6(10.7)	1
Present Study	2023	Pros	25/25	3(12)	5(20)	0.70

Eldesouky et al. (2019) found no significant difference in wound-related complications between TXA and NTXA groups (4.6% vs. 2%, p=0.790) in their prospective study of 115 patients (65 TXA, 50 NTXA)(34). Similarly, **Weissler et al.'s (2021)** retrospective analysis of 385 patients (257 TXA, 128 NTXA) reported comparable complication rates (2.2% vs. 2.7%, p=0.94).(50)

However, **Lohani et al.'s (2019)** prospective study of 93 patients (47 TXA, 46 NTXA) suggested a trend towards reduced complications with TXA (4.3% vs. 8.7%, p=0.13)(49). **Ausen et al.'s (2019)** prospective study of 108 patients (52 TXA, 56 NTXA) found similar complication rates (9.6% vs. 10.7%, p=1)(52). The **Present Study (2023)** reported a non-significant difference (12% vs. 20%, p=0.70) in their prospective analysis of 50 patients (25 TXA, 25 NTXA).(53)

The inconsistent results indicate that TXA's impact on wound-related complications remains unclear.

Table 26: Total no lymph nodes isolated

Authors	Year	Study design	N TXA/NTXA	TOTAL NO LYMPH NODES ISOLATED		P value
				TXA group	NTXA group	
Eldesouky et al(34)	2019	Pros	65/50	16.37 ± 3.56	15.63 ± 2.98	0.308
Present Study	2023	Pros	25/25	12 ± 8.61	11.88 ± 6.59	0.819

Eldesouky et al. (2019) and the **Present Study (2023)** found no significant difference in total lymph nodes isolated between TXA and NTXA groups (p=0.308 and p=0.819, respectively). (34)

The mean lymph node count varied slightly between studies, with Eldesouky et al. reporting 16.37 (TXA) and 15.63 (NTXA) nodes and the Present Study reporting 12 (TXA) and 11.88 (NTXA) nodes. However, this difference is likely due to differing sample sizes and patient populations.

Limitations of the Study

1. **Small Sample Size**: The study included only 50 patients, which may limit the generalizability of the findings. A larger sample size would be needed to detect more minor differences and to draw more statistically significant conclusions regarding the effects of tranexamic acid on postoperative outcomes.

2. **Single-Center Study**: Conducted at a single institution, the study's findings may not be widely applicable to other settings or patient populations. Multi-center studies would provide more diverse data and improve the external validity of the results.

3. **Non-Randomized Design**: The study did not use a randomized design, which could introduce selection bias. Randomization would have minimized potential confounding variables and provided a more rigorous assessment of the effects of tranexamic acid.

4. **Short Follow-Up Period**: The study focused on immediate postoperative outcomes, such as drain output and seroma formation. A more extended follow-up period is needed to assess the long-term effects of tranexamic acid on wound healing and other complications.

5. **Lack of Blinding**: Since the study did not involve blinding, bias in assessing outcomes is possible. Blinded assessments would reduce potential observer bias and ensure more objective evaluations of the effects of tranexamic acid.

6. **Limited Evaluation of Other Factors**: The study primarily focused on postoperative bleeding, drain output, and seroma formation. Other factors affecting postoperative outcomes, such as nutritional status, comorbidities, or intraoperative techniques, needed to be fully accounted for, potentially confounding the results.

CONCLUSION:

This study demonstrates that tranexamic acid effectively reduces postoperative drain output from Day 4 onwards, suggesting that it may help reduce seroma formation. However, there were no significant differences in wound complications, seroma formation, or intraoperative blood loss between the TXA and NTXA groups. While tranexamic acid showed potential benefits in reducing drain output, its impact on other postoperative outcomes, such as wound healing and seroma, remains inconclusive. Further studies with larger sample sizes are needed to confirm these findings and assess the broader applicability of tranexamic acid in reducing postoperative complications in breast cancer surgery.

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ANNEXURE 1

Participant Information Sheet

1. **STUDY TITLE:** A Prospective Study of the Role of tranexamic acid post-operative bleeding and seroma formation in Modified Radical Mastectomy.
2. **STUDY INVESTIGATORS:**
3. **Student:** (Name, Department): Dr. Madhu Babu, Junior resident, general surgery.
4. **Guide**(Name, Department): Dr Shyam Lal, professor, general surgery
5. **Co- Guide/s** (Name, Department): Dr. Swagata Brahmachari, Associate Professor, general surgery.
6. **Introduction**:

We are conducting a research study, "A Prospective Study of Role of Tranexamic Acid in Post-operative Bleeding and Seroma Formation in Modified Radical Mastectomy: A Case-control Study," in AIIMS Bhopal. If you agree to participate voluntarily, we will ask you to sign a consent form.]

7. **Purpose of the study:**

Our study aims to study the role of tranexamic acid in post-operative bleeding and seroma formation in Modified Radical Mastectomy.

This will help us find—the role of tranexamic acid in reducing postop bleeding and seroma formation in modified radical mastectomy patients.

8. **Taking part – what it involves:**

a. **Do I have to take part?**

Participation in this research is entirely voluntary. A decision to not take part or withdraw at any time will not affect your rights or medical care.

b. **What is expected of me if I take part?**

If you participate, we will give tranexamic acid during the perioperative period.

c. **How long will my part in the study last?**

Your participation in the study would last for three weeks after surgery.

d. Do I have to come for extra visits or undergo extra investigations for the study?

There will be no monetary benefits, and you will not be provided with expenses for follow-up travel.

e. What are the possible benefits of taking part?

The study will help to understand the role of tranexamic acid in reducing postoperative bleeding and seroma formation, which will help other patients undergoing modified radical mastectomy**.**

f. What are the possible disadvantages and risks of taking part?

There will be no disadvantages or risks if you take part in the study

What happens to the information collected from me?

All information collected will be kept strictly confidential and not shared with anyone. Results from the study will be reported as group data and will not identify you in any way.

g. What if I change my mind regarding participation in the study?

You are entitled to change your mind and withdraw anytime during the study without any disadvantage or penalty.

h. Whom do I contact for more information or if I have further questions or concerns?

If you want any information or have questions or concerns, you can contact:

Dr. Madhu Babu

Postgraduate student,

Department of General Surgery AIIMS, Bhopal

8121601156,

Mangalapallemadhu55@gmail.com

Dr. Shashank Purwar

Member Secretary,

Institute Ethics Committee – Student Research

(7773010099,ihecpgr@aiimsbhopal.edu.in)

प्रतिभागी सूचना पत्र

1. अध्ययन शीर्षक: मॉडिफाइड रेडिकल मास्टक्टोमी में ऑपरेशन के बाद ब्लीडिंग और सेरोमा बनने के बाद ट्रानेक्सैमिक एसिड की भूमिका पर केस कंट्रोल स्टडी, एक केस कंट्रोल स्टडी

2. **अध्ययन अन्वेषक**:

3. **छात्र** : (**नाम, विभाग**) : डॉ. मधु बाबू निवासी जूनियट, जनरल सर्जरी।

4. **गाइड** (**नाम, विभाग**): डॉ श्याम लाल, प्रोफेसर, जनरल सर्जरी

5. **सह-मार्गदर्शक** (**नाम, विभाग**): डॉ. स्वागत ब्रह्मचारी, एसोसिएट प्रोफेसर, सामान्य शल्य चिकित्सा।

6. **परिचय**:

हम एम्स भोपाल में "ए प्रॉस्पेक्टिव स्टडी ऑफ़ रोल ऑफ़ ट्रानेक्सैमिक एसिड इन पोस्ट-ऑपरेटिव ब्लीडिंग एंड सेरोमा फॉर्मेशन इन मॉडिफाइड रेडिकल मास्टक्टोमी: ए केस कंट्रोल स्टडी" पर एक शोध अध्ययन कर रहे हैं। यदि आप स्वेच्छा से भाग लेने के लिए सहमत हैं, तो हम आपसे एक सहमति फॉर्म पर हस्ताक्षर करने के लिए कहेंगे।

1. अध्ययन का उद्देश्यः

हमारे अध्ययन का उद्देश्य मॉडिफाइड रेडिकल मास्टेक्टॉमी में पोस्ट ऑपरेटिव ब्लीडिंग और सेरोमा फॉर्मेशन में ट्रानेक्सैमिक एसिड की भूमिका का अध्ययन करना है।

यह संशोधित रेडिकल मास्टक्टोमी रोगी में पोस्टोप रक्तस्राव और सेरोमा गठन को कम करने में ट्रानेक्सैमिक एसिड की भूमिका खोजने में मदद करेगा।

2. भाग लेना – इसमें क्या शामिल है ?

a. क्या मुझे भाग लेना चाहिए ?

इस शोध में भागीदारी पूरी तरह से स्वैच्छिक है। भाग न लेने या किसी भी समय वापस लेने का निर्णय किसी भी तरह से आपके अधिकारों या चिकित्सा देखभाल को प्रभावित नहीं करेगा।

b. यदि मैं इसमें शामिल होता हूं तो मुझसे क्या अपेक्षित हैं ?

यदि आप भाग लेते हैं, तो हम पेरिओपरेटिव अवधि के दौरान ट्रानेक्सैमिक एसिड देंगे।

c. अध्ययन में मेरी भागीदारी कब तक चलेगी ?

अध्ययन में आपकी भागीदारी सर्जरी के बाद 3 सप्ताह तक चलेगी।

d. क्या मुझे इस अध्ययन के लिए अलग से आना पड़ेगा या अतिरिक्त जांच जरूरी होगी ।

कोई मौद्रिक लाभ नहीं होगा और आपको अनुवर्ती यात्रा के लिए खर्च प्रदान नहीं किया जाएगा।

e. इसमें शामिल होने से संभावित लाभ क्या है ?

अध्ययन पोस्टऑपरेटिव रक्तस्राव और सेरोमा गठन को कम करने में ट्रानेक्सैमिक एसिड की भूमिका को समझने में मदद करेगा, जो अन्य रोगियों को संशोधित रेडिकल मास्टक्टोमी में मदद करेगा।

f. इसमें भाग लेने से संभावित हानि एवं जोखिम ।

यदि आप अध्ययन में भाग लेते हैं तो कोई नुकसान और जोखिम नहीं होगा

g. मेरे बारे में एकत्र की गई सूचना का क्या किया जाएगा ?

एकत्र की गई सभी सूचना पूर्णतः गोपनीय रखी जाएगी तथा अध्ययन से प्राप्त निष्कर्षों को अन्य किसी से साझा नहीं किया जाएगा । इन्हें ग्रुप आंकड़े के रूप मे रिपोर्ट किया जाएगा और किसी भी तरह से आपकी पहचान उजागर नहीं होगी ।

h. इस अध्ययन मे भाग लेने के लिए मेरे विचार बदलने पर क्या होगा ?

अध्ययन के दौरान किसी भी समय बिना किसी क्षति या दंड के आपको अपने विचार बदलने का पूरा अधिकार है ।

I. इस संबंध मे अधिक जानकारी के लिए या बाद मे मेरे मन मे कोई प्रश्न या शंका होने पर मुझ किनसे संपर्क करना होगा

यदि आप कोई सूचना चाहते हैं या आपका कोई प्रश्न है या शंका है तो आप इन नंबरों पर संपर्क कर सकते हैं:

डॉ. (छात्र का नाम) **डॉ. शशांक पुरवार**

डॉ. मधु बाबू सदस्य सचिव,

जनरल सर्जरी विभाग संस्थान आचार समिति – छात्र अनुसंधान

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ANNEXURE 2

प्रतिभागी सूचना सहमति प्रपत्र

[PARTICIPANT INFORMED CONSENT FORM (PICF)]

इस अध्ययन के लिए प्रतिभागी का पहचान नंबरः …….....

Participant Identification Number for this Study: ……...

अनुसंधान का शीर्षकः A prospective study of role of tranexamic acid in postoperative bleeding and seroma in modified radical mastectomy.

शोधकर्ता छात्र का नाम : डॉ. मधु बाबू फोन नं: 8121601156

Name of Student Investigator :Dr Madhu Babu Tel No.(s) : 8121601156

शोध मार्गदर्शक का नाम : डॉ. श्यामलाल

Name of Thesis Guide : Dr Shyamlal

मैंने दिनांक 20.08.2022 के सूचना पत्रक संस्करण II में दिए गए सभी तथ्यों को सावधानीपूर्वक पढ़ लिया है/ मुझे अपनी भाषा में स्पष्ट रूप से विस्तारपूर्वक समझा दिया गया है, और मैंने तथ्यों को पूर्णतः समझ लिया है। मैं पुष्टि करता/ करती हूँ, कि मुझे सवाल पूछने के अवसर प्रदान किए गए। The contents of the information sheet version II dated 20 August 2022 that was provided have been read carefully by me / explained in detail to me, in a language that I comprehend, and I have fully understood the contents. I confirm that I have had the opportunity to ask questions.

मुझे इस अध्ययन की प्रकृति एवं उद्देश्य और इसके संभावित जोखिमों / लाभों तथा अध्ययन की अनुमानित अवधि एवं अन्य प्रासंगिक जानकारी के बारे में विस्तारपूर्वक समझा दिया गया है। मुझे पता है कि इस अध्ययन में मेरी भागीदारी स्वैच्छिक है तथा मैं इस अध्ययन से किसी भी समय बिना कोई कारण बताए, अपना नाम वापस लेने के लिए स्वतंत्र हूं और नाम वापस लेने पर मेरी चिकित्सा देखभाल या कानूनी अधिकारों पर कोई प्रभाव नहीं पड़ेगा। The nature and purpose of the study and its potential risks/benefits and expected duration of the study, and other relevant details of the study have been explained to me in detail. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal right being affected.

मैं समझता/समझती हूं कि इस अनुसंधान में मेरी भागीदारी से मेरे बारे में एकत्र की गई जानकारी और मेरे चिकित्सीय दस्तावेजों के किसी भी भाग को एम्स के जिम्मेदार व्यक्तियों द्वारा ही देखा जाएगा। मैं इन व्यक्तियों को मेरे रिकॉर्ड प्राप्त करने की अनुमति प्रदान करता/ करती हूँ। I understand that the information collected about me from my participation in this research and sections of any of my medical notes may be looked at by responsible individuals from AIIMS. I give permission for this individuals to have access to my records.

यदि प्रतिभागी बच्चा है तो उसकी मौखिक या लिखित सहमति प्राप्त की गई है। If participants is child, his/her verbal of written assent has been obtained.

मैं उक्त अध्ययन में भाग लेने के लिए सहमत हूं/I agree to take part in the above study.

_____

(प्रतिभागी के हस्ताक्षर / बांए अंगूठे का निशान) (Signature/Left Thumb Impression)

दिनांक/Date……स्थान/Place …….....

प्रतिभागी का नाम/Name of the participant…….....

पिता/पति/पत्नी का नाम /Son/Daughter/Spouse of…….

डाक का पूरा पता /Complete Postal Address ……....

अगर अशिक्षित हों / If illiterate.

सूचना पत्र को प्रतिभागी को पढ़ा और समझाया गया है और प्रश्न पूछने का अवसर दिया गया है। मैं पुष्टि करता हूं कि व्यक्ति ने स्वतंत्र रूप से अपनी सहमति दी है ।

The information sheet has been read and explained to the participant and given the opportunity to ask questions. I confirm that the individual has given consent freely.

कानूनी रूप से स्वीकार्य प्रतिनिधि या निष्पक्ष गवाह के हस्ताक्षर

Signature of Legally acceptable representative or impartial witness.

दिनांक/Date

एलएआर या निष्पक्ष गवाह का नाम / Name of LAR or impartial witness .

पता / Address :-

प्रमाणित किया जाता है कि उक्त सहमति मेरी उपस्थिति में प्राप्त की गई ।

This is to certify that the above consent has been obtained in my presence.

छात्र शोधकर्ता के हस्ताक्षर	दिनांक…….	स्थान……
Signature of the student Investigator	Date ……	Place ……

कृपया ध्यान दें: सहमति प्रपत्र तीन प्रतियों में (1) रोगी के लिए, (2) शोधकर्ता, (3) संस्थान के लिए तैयार करें ।

(छात्रों से अनुरोध है कि आसानी से समझ आने योग्य हिंदी अनुवाद स्वयं तैयार करें)

NB: Three copies should be made for (1) Patient, (2) Researcher, (3) Institution

(Students are requested to prepare the translation in simple, understandable Hindi independently.)

ANNEXURE 3

Patient Performa

UHID of the patient: Name:

Age: Sex :

Date:

- Pre-operative data

Smoking history (current smoker (Y or N):

Medical history (COPD, diabetes, cardiac disease, TB):

Preoperative Radiotherapy or chemotherapy:

Preoperative long-term corticosteroids:

Previous Breast surgeries:

- Intra op details

Type of operation:	
Type of anesthesia:	
Length of incision:	
Blood loss:	
Operation time duration:	
Antibiotic prophylaxis:	
Suture material:	
Pain medication:	

- Post-operative data

Duration of stay in Ward:								
Surgical site infection								
Drain output	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Total
Seroma								

Fever	
Wound gaping and discharge:	

ANNEXURE 4

CASE SHEET 1:-

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Name of the patient	Patient ID	Age/ Sex	weight	Height	BMI	Smoking	Comorbidit	Precop radi	preop long	Previous Breast surgeries	BREAST	SIZE	lymphnodes palpation	CTN	STAGE
2																
3	Sita Yogi	2.3921E+14	38/F	55 kg	164 cm	20.4	NO	NO	NO	NO	NO	Right	6 cm	No lymphnodes palpable	T3N0	IIB
4	Sunita Mehar	2.3921E+14	47/F	64 kg	150 cm	28.6	NO	HTN since 1	Chemother	NO	NO	Right	2 cm	No lymphnodes palpable	T1N0	I
5	phool Kali	2.3921E+14	55/F	48 kg	150 cm	21.3	NO	HTN and D	NO	NO	NO	Left	5 cm	No lymphnodes palpable	T3N0	IIB
6	Sangeeta Rathore	2.3921E+14	47/F	54 kg	155 cm	22.9	NO	NO	NO	NO	NO	Right	3 cm	No lymphnodes palpable	T2N0	IIA
7	Chuttan	2.3921E+14	57/F	60 kg	154 cm	26	NO	NO	NO	NO	NO	Right	4 cm	No lymphnodes palpable	T2N0	IIA
8	Sarju	2.3921E+14	70/F	50 kg	149 cm	22.5	NO	NO	NO	NO	NO	Left	3 cm	No lymphnodes palpable	T2N0	IIA
9	Jamuna Bai	2.3921E+14	48/F	58 kg	152 cm	25.1	NO	NO	Chemother	NO	NO	Left	No lump	No lymphnodes palpable	T1N0	I
10	Halki Bai	2.3921E+14	56/F	48 kg	147 cm	22.2	NO	NO	Chemother	NO	NO	Right	5 cm	Multiple axillary lymphnodes present	T3N2	IIIA
11	Sudha	2.3921E+14	52/F	58 kg	166 cm	21	NO	NO	NO	NO	NO	Right	4 cm	single lymphnode palpable	T2N1	IIB
12	damayanti	2.3921E+14	70/F	50 kg	154 cm	21.1	NO	NO	NO	NO	NO	Left	5 cm	single lymphnode palpable	T3N1	IIIA
13	Saroj Chaukiker	2.3921E+14	47 Y/F	50 Kg	152 cm	18.4	NO	NO	NO	NO	NO	Right	3 ccm	2 axillary lymphnodes palpable	T2N2	IIIA
14	USHA	2.3921E+14	65/F	52 kg	152 cm	22.5	NO	NO	6 CYCLES -	NO	NO	Left	4 cm	No lymphnodes palpable	T2N0	IIA
15	Anjana Mahalaha	2.3921E+14	56Y/F	59 kg	156 cm	24.2	NO	HTN	NO	NO	NO	LEFT	4 cm	single lymphnode palpable	T2N1	IIB
16	Asha Ahirwar	2.3921E+14	41Y/F	57 kg	148 cm	26	NO	THYROID	NO	NO	NO	Right	5 cm	No lymphnodes palpable	T3N0	IIB
17	Hemlata Mahuwar	2.3921E+14	32Y/F	49 kg	168 cm	17.4	NO	NO	chemother	NO	NO	Right	4 cm	No lymphnodes palpable	T2N0	IIA
18	Krishna Bai	2.3921E+14	55Y/F	62 kg	164 cm	23.1	No	NO	NO	NO	NO	Right	5 cm	No lymphnodes palpable	T3N0	IIB
19	Padma Mali	2.3921E+14	41Y/F	58 kg	154 cm	24.5	NO	NO	NO	NO	LUMPECTOMY	Right	NO LUMP	No lymphnodes palpable	T1N0	I
20	Rani Wania	2.3921E+14	50 Yr/F	53 kg	159 cm	21	NO	T2 DM, HTI	Chemother	NO	NO	Left	7 cm	No lymphnodes palpable	T3N0	IIB
21	Reshm Bai Ginnore	2.3921E+14	56Y/F	60 kg	164 cm	22.3	NO	T2 DM, HTI	NO	NO	NO	Left	8 cm	No lymphnodes palpable	T3N0	IIB
22	Yogita Jaiswal	2.3921E+14	50 Yr/F	52 kg	156 cm	21.4	NO	TB, THYRO	Chemother	NO	NO	Right	6 cm	No lymphnodes palpable	T3N0	IIB
23	Kavita Kori	2.3921E+14	40 Y/F	55 kg	152 cm	23.8	NO	NO	NO	NO	NO	Left	2 cm	No lymphnodes palpable	T1N0	I
24	Mamta	2.3921E+14	38 Yr/F	58 kg	150 cm	25.8	NO	NO	Chemother	NO	NO	Right	3 cm	No lymphnodes palpable	T2N0	IIA
25	Shahida Bee	2.3921E+14	40/F	60 kg	160 cm	23.4	NO	NO	NO	NO	NO	Right	5 cm	single lymphnode palpable	T3N1	IIIA
26	Koushalya Malvia	2.3921E+14	56Y/F	58 kg	150 cm	25.8	NO	Hypothyroi	NO	NO	NO	Right	3 cm	3 lymphnodes palpable	T2N2	IIIA
27	Fundi Bai	2.3921E+14	78 Yr/F	48 kg	148 cm	21.9	NO	NO	NO	NO	NO	Left	3 cm	No lymphnodes palpable	T2N0	IIA

CASE SHEET 2:-

	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF
1	STAGE	Quadrant	BIRADS SCORE	Type of op	Type of an	Length of incisi	Blood loss	Operation time	Antibiotic prop	Suture material	Pain medicatio	Pathological type	LV invasion		hormonal status		
2														ER	PR	HER2NUE	KI67
3	IIB	Upper outer quadrant	BIRADS 4b	MRM	GA	15 cm	80 ml	150mins	ING AUGMENTI	NYLON 3.0 RC	Paracetamol	Invasive carcinoma of no special type (Ductal)	Absent	Positive	Positive	Negative	14%
4	I	Upper outer quadrant	BIRADS 4C	MRM	GA	15 cm	80 ml	130 mins	ING AUGMENTI	MONOCRYL 3.0	Paracetamol, D	Invasive carcinoma of no special type (Ductal)	absent	Negative	Negative	Negative	75%
5	IIB	Upper outer quadrant	BIRADS 5	MRM	GA	18 cm	80 ml	240 mins	ING AUGMENTI	MONOCRYL 3.0	Paracetamol, D	Invasive carcinoma of no special type (Ductal)	Present	Positive	Positive	Positive	14%
6	IIA	Upper inner quadrant	BIRADS 4C	MRM	GA	15 cm	50 ml	210 min	ING AUGMENTI	TRUEBARB	Diclo	Invasive carcinoma of no special type (Ductal)	Absent	Positive	Negative	Equivocal	10%
7	IIA	Upper inner	BIRADS 4C	MRM	GA	18 cm	100ml	160 min	ING AUGMENTI	TRUEBARB	Diclo	Invasive carcinoma of no special type (Ductal)	Absent	Positive	Negative	Negative	20%
8	IIA	Upper outer quadrant	BIRADS 4C	MRM	GA	15 cm	100 ml	120 min	ING AUGMENTI	NYLON 3.0 RC	Diclo , PCM	Invasive carcinoma of no special type (Ductal)	Absent	Positive	Negative	Negative	14%
9	I	No tumor identified	-	MRM	GA	18 cm	80 ml	150 min	ING AUGMENTI	VICRYL, NYLON	PCM, DICLO	Invasive carcinoma of no special type (Ductal)	Absent	Negative	Negative	Positive	40%
10	IIA	Central Quadrant	BIRADS 4b	MRM	GA	16 cm	40 ml	120 mimn	ING CEFO SB	NYLON 3.0 RC	PCM, DICLO	Invasive carcinoma of no special type (Ductal)	Absent	Negative	Negative	Negative	10%
11	IIB	Upper outer quadrant	BIRADS 4b	MRM	GA	18 cm	80 ml	190 min	ING AUGMENTI	VICRYL, MONO	DICLO	Invasive carcinoma of no special type (Ductal)	Absent	Positive	Negative	Positive	80%
12	IIA	Central Quadrant	BIRADS 4C	MRM	GA	18CM	150 ml	135 min	ING AUGMENTI	BARBED	DICLO	Invasive carcinoma of no special type (Ductal)	Absent	Positive	Negative	Negative	26%
13	IIA	Upper inner quadrant	BIRADS 4b	MRM	GA	18 CM	80 ML	150 MIN	ING AUGMENTI	BARBED SUTUR	PCM, DICLO	Invasive carcinoma of no special type (Ductal)	Absent	Positive	Positive	Equivocal	10%
14	IIA	Central quadrant	BIRADS 4C	MRM	GA	16 CM	110ML	140 MIN	ING AUGMENTI	BARBED SUTUR	PCM, DICLO	Invasive carcinoma of no special type (Ductal)	Absent	Negative	Negative	Positive	25%
15	IIB	Upper inner quadrant	BIRADS 4C	MRM	GA	18 CM	150 ML	180 MIN	ING AUGMENTI	VICRYL, MONO	PCM, DICLO	Invasive carcinoma of no special type (Ductal)	Absent	Positive	Positive	Negative	7%
16	IIB	Upper inner	BIRADS 4b	MRM	GA	17 CM	100 ML	120 MIN	ING AUGMENTI	VICRYL, MONO	PCM, DICLO	Invasive carcinoma of no special type (Ductal)	absent	Negative	Negative	Positive	70%
17	IIA	Lower inner	BIRADS 4b	MRM	GA	18 CM	100 ML	180 MIN	ING AUGMENTI	VICRYL, MONO	PCM, DICLO	Invasive carcinoma of no special type (Ductal)	Present	-	-	-	-
18	IIB	Upper outer quadrant	BIRADS 5	MRM	GA	16 CM	80 ML	140 MIN	ING AUGMENTI	VICRYL, MONO	PCM, DICLO	Invasive carcinoma of no special type (Ductal)	Present	Negative	Negative	Positive	45%
19	I	Upper outer quadrant	NOT DONE	MRM	GA	15 CM	100 ML	120 MIN	ING AUGMENTI	VICRYL, MONO	PCM, DICLO	Invasive carcinoma of no special type (Ductal)	absent	-	-	-	-
20	IIB	Central quadrant	BIRADS 4b	MRM	GA	17 CM	120 ML	160 MIN	ING AUGMENTI	VICRYL, MONO	PCM, DICLO	Invasive carcinoma of no special type (Ductal)	Absent	Negative	Negative	Positive	50%
21	IIB	Lower inner quadrant	BIRADS 4b	MRM	GA	16 CM	100 ML	140 MIN	ING AUGMENTI	VICRYL, MONO	PCM, DICLO	Invasive carcinoma of no special type (Ductal)	present	Positive	Negative	Equivocal	80%
22	IIB	central	BIRADS 4b	MRM	GA	18 CM	120 ML	110 MIN	ING AUGMENTI	VICRYL, MONO	PCM, DICLO	Invasive carcinoma of no special type (Ductal)	Present	Positive	Positive	Negative	40%
23	I	Upper outer quadrant	BIRADS 4a	MRM	GA	16 CM	100 ML	180 MIN	ING AUGMENTI	BARBED SUTUR	PCM, DICLO	Invasive carcinoma of no special type (Ductal)	Absent	Positive	Negative	Negative	10%
24	IIA	Lower outer quadrant	BIRADS 4C	MRM	GA	18 CM	50 ML	150 MIN	ING AUGMENTI	BARBED SUTUR	PCM, DICLO	Invasive carcinoma of no special type (Ductal)	Absent	Negative	Negative	Negative	14%
25	IIA	Upper outer quadrant	BIRADS 5	MRM	GA	16 CM	110 ML	140 MIN	ING AUGMENTI	VICRYL, MONO	PCM, DICLO	Invasive carcinoma of no special type (Ductal)	Present	Positive	Positive	Negative	35%
26	IIA	Upper outer quadrant	BIRADS 4C	MRM	GA	16 CM	80 ML	160 MIN	ING AUGMENTI	BARBED SUTUR	PCM, DICLO	Granulomatous mastitis	absent	-	-	-	-
27	IIA	Lower outer quadrant	BIRADS 5	MRM	GA	18 CM	120 ML	120 MIN	ING AUGMENTI	VICRYL, MONO	PCM, DICLO	Invasive carcinoma of no special type (Ductal)	Absent	Positive	Positive	Positive	40%

CASE SHEET 3:-

	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA
1	atus				staging		mphnodes iden	Lymphnodes showing deposits	Surgical sit	Drain output								Duration o	Seroma aft	Fever	Wound gaping and dis		Post op hos
2	HER2NUE	Ki67		T	N	M				D1	D2	D3	D4	D5	D6	D7	TOTAL						
3	Negative	14%	Luminal A	pT2	N0	Mx	14	0	-	10	25	150	20	10	20	10	245	10 days	-	-	-		7 days
4	Negative	75%	TNBC	ypT1	N0	Mx	10	0	-	50	50	30	20	10	10	10	180	10 days	-	-	Falp necrosis 10 - 30 %		10 days
5	Positive	14%	Luminal B	pT2	N0	Mx	11	0	-	150	100	70	40	20	20		425	10 days	-	-	-		8 days
6	Equivocal	10%	Luminal A	pT2	N1a	Mx	14	2		50	100	50	10	15			225	7 days	-	-			7 days
7	Negative	20%	Luminal B	ypT3	N0	Mx	11	0	Grade 2	40	30	25	20		30	20	165	20 days	-	-	Falp necrosis < 10 %		7 days
8	Negative	14%	Luminal A	pT2	N0	Mx	5	0		50	50	20	20	20	10		390	7 days	-	-			8 days
9	Positive	40%	Her2nue	ypTis	N0	Mx	8	0	Grade 1	100	80	30	15	15			240	10 days	-	-	-		7 days
10	Negative	10%	TNBC	ypT3	N2a	Mx	16	6		70	125	50	80	90			415	3 days	-	-			4 days
11	Positive	80%	Luminal B	pT1c	N1	Mx	17	1		150	130	200	30	20	20		655	8 days	-	-			7 days
12	Negative	26%	Luminal B	pT2	N2a	Mx	19	9		100	20	20	20		15	15	30	8 days	-	-	-		7 days
13	Equivocal	10%	Luminal A	pT1b	N0	Mx	12	0	-	200	100	100	20		20	20	460	8 days	100 ml	-	-		10 days
14	Positive	25%	Her2nue	yT1c	N0	Mx	8	0	-	60	40	25	60	80			460	12 days	-	-	-		6 Days
15	Negative	7%	Luminal A	pT3	N2a	MX	5	5	Grade 2	180	150	150	50	15	20	30	595	10 days	-	-	Falp necrosis < 10 %		13 Days
16	Positive	70%	Her2nue	pT2	N1a	MX	14	1		100	120	80	100	50	30		480	6 days	-	-	-		6 DAYS
17	-	-	-	ypT3	N3a	MX	20	18		200	180	150	30	20	20	10	610	9 days	-	-	-		10 DAYS
18	Positive	45%	Her2nue	pT2	N1a	Mx	10	2		150	140	120	200	180	15	20	825	8 days	55 CC	-	-		9 DAYS
19	-	-		pT0	N0	MX	14	0		100	80	80	80	50	20	30	440	6 days	-	-	Falp necrosis < 10 %		7 days
20	Positive	50%	Her2nue	ypT3	N0	Mx	8	0		80	50	40	30	20	30		250	5 days	-	-	-		6 days
21	Equivocal	80%	Luminal B	pT2	N0	N0	10	0		120	100	80	50		20		370	5 days	-	-			6 days
22	Negative	40%	Luminal B	ypT3	N1a	MX	6	1		120	100	80	50		20		370	6 days	-	-			7 DAYS
23	Negative	10%	Luminal A	pT2	N1a	Mx	10	1	-	180	150	80	100	40	50	10	610	6 days	-	-	-		7 days
24	Negative	14%	TNBC	ypT2	N0	Mx	14	0	-	100	80	50	50	20			300	5 days	-	-	-		5 days
25	Negative	35%	Luminal B	pT2	N2a	Mx	19	9		150	150	140	80		100		620	10 days	-	-			7 days
26	-	-	-			-	25	0	-	200	220	150	30		90		690	6 days	100 ml	-	-		7 days
27	Positive	40%	Luminal B	pT1c	cN0	MX	14	0	-	120	110	70		100			400	5 days	-	-	-		7 days
28																	10450						

CONTROL SHEET 1:-

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Name of the patient	Patient ID	Age/	Sex	weight	Height	BMI	Smoking	Comorbidities	Preop radiotherapy or chemotherapy	preop long term use of corticosteroids	Previous Breast surgeries	BREAST	SIZE	lymphnodes palpatioin	CTN	STAGING
2																	
3	Sarada devi	2.39212E+14	50Y/F		65 kg	153 CM	27.8	NO	NO	Chemotherapy	NO	NO	right	4 cm	no lymphnodes palpable	T2N0	IIA
4	Resham Bai	2.39212E+14	56Y/F		51 kg	149 CM	23	NO	HTN since 2 M	NO	NO	NO	Left	5 cm	no lymphnodes palpable	T3N0	IIB
5	Mamta Agarwal	2.39212E+14	45Y/F		54 KG	156 CM	22.2	NO	NO	Chemotherapy 8 cycles	NO	NO	Left	NO LUMP PALPA	single hard lymphnode pa	T1N1	I
6	Janki bai	2.39212E+14	48Y/F		42 KG	148 CM	19.2	NO	Acynotic heart	chemotherapy	NO	NO	right	4 cm	no lymphnodes palpable	T2N0	IIA
7	Kamla Bai	2.39212E+14	59Y/F		55 kg	158 CM	22	NO	NO	NO	NO	NO	right	4 cm	no lymphnodes palpable	T2N0	IIA
8	Kanchan	2.39212E+14	54Y/F		62 KG	159 CM	24.5	NO	DM	Chemotherapy 6 cycle	NO	NO	left	2 cm	2 axillary lymphnodes pal	T2LN2	IIA
9	Sangeeta	2.39212E+14	40Y/F		64 kg	161 CM	24.7	NO	NO	Chemotherapy 4 cycle	NO	NO	left	5 cm	no lymphnodes palpable	T3N0	IIB
10	Kamla Dubey	2.39212E+14	55Y/F		52 kg	156 cm	21.4	NO	T2 DM, HTN	Chemotherapy 4 cycle	NO	NO	right	5 cm	no lymphnodes palpable	T3N0	IIB
11	Meena Jain	2.39212E+14	61Y/F		50 KG	158 CM	20	NO	NO	Chemotherapy 6 cycle	NO	NO	right	NO LUMP PALPA	no lymphnodes palpable	T1N0	I
12	Savita	2.39212E+14	45Y/F		58 KG	168 CM	20.5	NO	NO	NO	NO	NO	left	2 cm	no lymphnodes palpable	T1N0	I
13	Girja Bai	2.39212E+14	69Y/F		75 kg	170 CM	26	NO	HTN	NO	NO	NO	right	4 cm	no lymphnodes palpable	T2N0	IIA
14	Prabha	2.39212E+14	40Y/F		72 KG	166 CM	26.1	NO	NO	NO	NO	NO	right	3 cm	no lymphnodes palpable	T2N0	IIA
15	Mamta	2.39212E+14	45Y/F		50 kg	152 CM	21.6	NO	DM	CHEMOTHERAPY 6 CYCLES	NO	NO	right	4 cm	Multiple axillary lymphno	T2N2	IIA
16	Ramsabha Bai	2.39212E+14	65Y/F		54 KG	164 CM	20.1	NO	HTN	CHEMOTHERAPY 4 CYCLES	NO	NO	Left	2 cm	no lymphnodes palpable	T1N0	I
17	Preeti Bansal	2.39212E+14	42Y/F		55 kg	158 CM	22	NO	NO	NO	NO	NO	Left	5 cm	2 Lymphnodes palpable	T3N2	IIA
18	Usha Shrivastava	2.39212E+14	61Y/F		58 kg	154 cm	24.5	NO	HTN , DM	CHEMOTHERAPY 6 CYCLES	NO	NO	Right	7 cm	no lymphnodes palpable	T3N0	IIB
19	Nirmla Pateriya	2.39212E+14	57Y/F		53 kg	159 cm	21	NO	NO	CHEMOTHERAPY 4 CYCLES	NO	NO	Left	7 cm	no lymphnodes palpable	T3N0	IIB
20	Gulab Vati Tiwari	2.39212E+14	35Y/F		64 KG	166 CM	23.2	NO	NO	NO	NO	NO	Right	4 cm	Single lymphnode palpabl	T2N1	IIB
21	Meera Khare	2.39212E+14	68Y/F		58 KG	159 CM	22.9	NO	DM, HTN, CAD	CHEMOTHERAPY 4 CYCLES	NO	NO	Right	NO LUMP PALPA	no lymphnodes palpable	T1NO	I
22	Sadhana Tiwari	2.39212E+14	50Y/F		65 KG	168 CM	23	NO	NO	CHEMOTHERAPY 4 CYCLES	NO	NO	Left	4 cm	3 LYMPHNODES PALPABLE	T2N2	IIA
23	Sumitra Devi	2.39212E+14	40Y/F		68 KG	160 CM	26.6	NO	NO	CHEMOTHERAPY 4 CYCLES	NO	NO	Right	4 cm	no lymphnodes palpable	T2N0	IIA
24	Savitri	2.39212E+14	70Y/F		53 KG	170 CM	18.3	NO	HTN	NO	NO	NO	Left	4 cm	no lymphnodes palpable	T2N0	IIA
25	Samreen Anjum	2.39212E+14	41Y/F		56 KG	156 CM	23	NO	NO	CHEMOTHERAPY 4 CYCLES	NO	NO	Left	4 cm	3 LYMPHNODES PALPABLE	T2N2	IIA
26	Manju Devi	2.39212E+14	36Y/F		66 KG	160 CM	25.8	NO	NO	CHEMOTHERAPY 6 CYCLES	NO	NO	Left	3 cm	Single lymphnode palpabl	T2N1	IIB
27	Lellamma	2.39212E+14	65/F		49 KG	148 CM	22.4	NO	HTN	NO	NO	NO	right	2 cm	no lymphnodes palpable	T2NO	IIA

CASE SHEET 2:-

Quadrant	BIRADS SCORE	Type of operation	Type of anaesthesia	Length of incision	Blood loss	Operation time duration	Antibiotic prophylaxis	Suture material	Pain medication	LV invasion	Pathological type	ER
Upper outer quadrant	BIRADS 6	MRM	GA	15 cm	50 ml	140 mins	ING AUGMENTIN	NYLON 3.0 RC	Paracetamol	Absent	Invasive carcinoma c	Negative
Lower inner quadrant	BIRADS 4b	MRM	GA	15 cm	50 ml	180 mins	ING AUGMENTIN	EHILON 3.0 RC	Diclo	present	Invasive carcinoma I	Positive
no Lump	no	MRM	GA	18 cm	120 ml	210 mins	ING AUGMENTIN	MONOCRYL 3.0 RC	Tramadol	absent	No residual tumour	not assesed
central	BIRADS 5	MRM	GA	18cm	80ml	210mins	ING AUGMENTIN	VICRYL, STAPLERS	DICLO,PCM	absent	Invasive lobular carc	Positive
Upper outer quadrant.	BIRADS 5	MRM	GA	8 cm	50ml	1300 mins	ING AUGMENTIN	ETHILON	PCM, DICLO	absent	Invasive carcinoma c	Negative
Lower inner quadrant	BIRADS 4b	MRM	GA	18 cm	100 ml	120 mins	ING AUGMENTIN	VICRYL, NYLON	DICLO, PCM	absent	Invasive carcinoma c	Negative
Central quadrant	BIRADS 4b	MRM	GA	16cm	100ml	210 mins	ING AUGMENTIN	NYLON	PCM, DICLO	Absent	Invasive carcinoma c	Positive
Central quadrant	BIRADS 6	MRM	GA	16 cm	50 ml	110 min	ING AUGMENTIN	NYLON	PCM, DICLO	absent	Invasive carcinoma c	Positive
no Lump	BIRADS 4b	MRM	GA	16 cm	80 ml	120min	ING AUGMENTIN	NYLON	PCM, DICLO	absent	No residual tumour	not assesed
Upper outer	BIRADS 4b	MRM	GA	15 cm	50 ml	120 min	ING AUGMENTIN	VICRYL, NYLON	PCM, DICLO	absent	Invasive carcinoma c	Positive
Upper outer	BIRADS 5	MRM	GA	16 Cm	100 ml	130 min	ING AUGMENTIN	NYLON	COMBIFLAM	absent	Invasive carcinoma I	Positive
Upper Outer quadrant	BIRADS 4b	MRM	GA	15 CM	100 ml	110 min	ING AUGMENTIN	NYLON	PCM, DICLO	Absent	Invasive carcinoma c	Negative
Upper outer quadrant	BIRADS 5	MRM	GA	18 CM	150 ML	150 MIN	ING AUGMENTIN	BARBED	PCM, DICLO	absent	Invasive carcinoma I	Positive
central quadrant	BIRADS 5	MRM	GA	16 CM	120 ML	150 MIN	ING AUGMENTIN	NYLON	PCM, DICLO	Absent	Invasive carcinoma c	Negative
central	BIRADS 6	MRM	GA	16 CM	180 ML	120 MIN	ING AUGMENTIN	NYLON	PCM, DICLO	Present	Invasive carcinoma c	Negative
Lower outer quadrant	BIRADS 5	MRM	GA	16 CM	120 ML	150 MIN	ING AUGMENTIN	NYLON	PCM, DICLO	Absent	Invasive carcinoma c	Negative
Upper inner quadrant	BIRADS 6	MRM	GA	15 CM	120 ML	160 MIN	ING AUGMENTIN	NYLON	PCM, DICLO	Absent	Invasive carcinoma c	Negative
Central quadrant	BIRADS 4b	MRM	GA	16 CM	140 ML	150 MIN	ING AUGMENTIN	NYLON	PCM, DICLO	Present	Invasive carcinoma c	Positive
Central quadrant	BIRADS 4b	MRM	GA	18 CM	110 ML	110 MIN	ING AUGMENTIN	NYLON	PCM, DICLO	Absent	Invasive carcinoma c	Negative
Lower inner	BIRADS 4b	MRM	GA	16 CM	120 ML	150 MIN	ING AUGMENTIN	NYLON	PCM, DICLO	Absent	Invasive carcinoma c	Negative
Central quadrant	BIRADS 5	MRM	GA	18 CM	100 ML	130 MINS	ING AUGMENTIN	NYLON	DICLO, PCM	absent	Invasive carcinoma c	Positive
Central quadrant	BIRADS 4b	MRM	GA	16 CM	180 ML	190 MINS	ING AUGMENTIN	NYLON	DICLO, PCM	PRESENT	Invasive carcinoma c	Negative
Lower outer quadrant	BIRADS 4A	MRM	GA	18 CM	120 ML	130 MINS	ING AUGMENTIN	NYLON	DICLO, PCM	absent	Invasive carcinoma I	Negative
Upper inner quadrant	BIRADS 6	MRM	GA	16 Cm	150 ML	110 min	ING AUGMENTIN	NYLON	DICLO, PCM	present	Invasive carcinoma I	Negative
Central quadrant	BIRADS 4b	MRM	GA	7 cm	120 ml	120 min	ING AUGMENTIN	VICRYL, NYLON	PCM, DICLO	Absent	Invasive carcinoma I	Positive

CASE SHEET 3:-

hormonal status				clinical staging		ymphnodes isol	LYMPHNODES showin	Surgical site	Drain output								DURATION	Seroma aft	Fever	Wound gaping and dis	Post op hospital stay
PR	HER2NUE	KI67	T staging	N staging	M staging				D1	D2	D2	D4	D5	D6	D7	TOTAL					
Negative	Negtive	70% TNBC	ypT3	N1a	Mx	13	2	Grade 1	50	50	20	20	10			150	5 days	-	-	-	7 days
Negative	equivocal	80% LUMINAL B	pT2	N0	Mx	10	0	-	30	50	50	20	10			160	5 days	-	-	Falp necrosis 10 - 30 %	7 days
not assesed	not assesed	not assesed -	ypT0	N1a	Mx	3	3	-	200	50	100	50	20			420	7 days	-	-	-	7 days
Positive	Negtive	10% Luminal A	ypT1b	N0	MX	0	0	-	50	30	10	10	15			115	5 days	-	-	-	6 days
Negative	Positive	70% Her2nue	pT2	N1a	Mx	12	12	-	30	25	50	20				125	8 days	-	-	-	4 days
Negative	Positive	70% Her2nue	ypT3	N3a	Mx	14	10	-	80	50	30	30	20	20	10	240	10 days	-	-	-	10 days
Positive	Positive	70% Luminal B	ypT3	N1a	Mx	14	2	-	50	50	30	15	15	50	20	230	16 days	40- 50 ml seroma noted			14 days
Positive	Negtive	14% Luminal A	ypT3	N0	Mx	12	0	Grade 2	60	150	100	100	90	80	80	660	20 days	100 ml of s	-	Falp necrosis 10 - 30 %	14 days
-	-	- -	ypT0	N0	Mx	8	0	-	120	70	70	30	20			310	5 days	-	-	-	4 days
Positive	Negative	10% Luminal A	pT2	N0	Mx	10	0	-	60	30	20	30				140	5 days	-	-	-	5 days
Negative	Positive	70% Luminal B	pT2	N1a	Mx	11	2	-	300	50	30	20				400	4 days	80 ml of seroma note	skin flap necrosis pres		7 days
Negative	Positive	80% Her2nue	pT1b	N1	M x	9	1	-	150	120	100	80	80	50	50	630	8 days			-	
Negative	Negative	70% Luminal B	ypT3	N0	M0	6	2	-	50	50	15	50	15			180	8 days			Falp necrosis < 10 %	7 days
Negative	Positive	35% Luminal B	ypT1c	N1a	Mx	17	2	-	200	200	250	100	50	20	20	840	7 days	-	-	-	8 DAYS
Negative	Positive	45% Luminal B	pT2	N2a	Mx	17	9	-	50	50	30	30	20	30		210	6 day	-	-	-	4 DAYS
Negative	Positive	35% Her2nue	ypT1	N0	Mx	15	15	Grade 2	300	280	280	200	180	150	100	1490	8 days	200 ML of seroma not		Falp necrosis < 10 %	6 DAYS
Negative	Positive	70% Her2nue	ypT1c	N0	Mx	15	0	-	150	100	100	80	50			480	7 days	-	-	-	7 DAYS
Negative	Negative	10% Luminal A	pT1a	N1a	Mx	7	7	-	100	80	50	30	20			280	5 days	-	-	-	5 DAYS
Negative	Positive	30% Her2nue	ypT0	N0	Mx	17	0	-	100	120	80	50				350	8 days	-	-	-	5 DAYS
Negative	Positive	70% Her2nue	ypT2	N3a	Mx	22	10	-	80	100	50	50				280	6 days	-	-	Falp necrosis 10 - 30 %	4 DAYS
Positive	Positive	14% Luminal B	ypT1a	N0	Mx	13	0	-	180	150	140	100	40	40	30	680	8 days	-	-	-	6 DAYS
Negative	Negative	10% TNBC	pT2	N0	Mx	13	0	-	110	130	100	50	20	20		430	6 days	-	-	-	6 DAYS
Negative	Negative	40% TNBC	ypT2	N1a	Mx	14	4	-	150	150	130	80				510	8 days	-	-	-	4 days
Negative	Negative	10% TNBC	pTmi	N0	Mx	5	0	-	50	50	30	30				160	4 days	-	-	-	4 days
Positive	Negative	40% Luminal B	pT2	N1a	Mx	10	1	-	250	250	200		100	50	70	880	15 days	250 ml of s	-	-	6 days
																10250					